40 Rock ©

POPULAR Computing WEEKLY

SPECIAL TAPE OFFER

35p 12-18 January 1984 Vol 3 No 2

This Week

Street Life

David Kelly talks to micro artist Stuart Hughes about his work illustrating computer games and books. See page 13.

Programming

W Masefield shows you how to use your micro to help you understand Newton's Laws of Motion. See page 21.

Reviews

The ZX81 is still selling — Andy Wilson looks at some of the software recently released for it. See page 14.

New releases

This week's releases include *Fighter Pilot* by Digital Integration and *Royal Birkdale* by Ocean Software. Page 56.

★STAR GAME★

Noughts and Crosses. See page 10.

News Desk

A quantum leap from Sinclair

WELL, here it is! The new Sinclair QL microcomputer.

It is based on the 68000 16-bit processor with 128K Ram and twin microdrives as standard, all for a price of £399. Also supplied with each machine is a highly advanced suite of software: spreadsheet, database, word-processing and business graphics packages — over 300K of machine code software supplied on four micro cassettes, each with an accompanying manual.

The machine will not be software compatible with existing ZX Spectrum software and the QL runs a new version of Basic — the so-called SuperBasic.

Up to 90K is addressable in SuperBasic which includes structured programming commands and support procedures. Five user-definable function keys are provided. SuperBasic has a keyword entry mode.

The machine has a bit-mapped colour high-resolution screen — 32K of Ram is reserved for the display.

The QL has a built-in multi-tasking facility with a new QDOS operating system and full networking, enabling up to

Continued on page 5

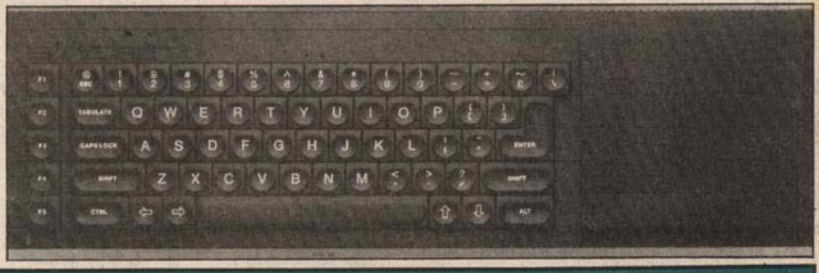
Successors to the 64

COMMODORE has exhibited two new home computers — successors to the Commodore 64 machine — at the Consumer Electronics Show at Las Vegas.

Both are based around the same, a new microprocessor chip — the 7501 — and consequently software for the new machines will not be compatible with that for either the Commodore 64 or the Vic20.

The first new micro is to be called the Commodore 264. It has 32K Rom and 64K Ram of which 60K is addressable in Basic. Maximum screen resolution is 320 × 200 pixels and the 264 has two sound generators each with eight

Continued on page 5



Classified Classified Classified Classified

Computer Swap 01-437 4343

Free readers entries to buy or sell a computer. Ring 01-437 4343 and give us the details.

AQUARIUS SEE PAGE 53

VALHALLA

SHADOW FOR THE BBC 32K

Shadow will allow you to make security back-ups of your valuable tape software.
★ Any OS ★ 100% machine code ★ Basic I and Basic II ★ 1200 + 300 baud ★ "Locked" programs ★ Files ★ Any length ★ Easy to use.
Shadow works with 99% of all known programs including "locked" programs or those containing sections at 300 baud.
FREE Inspector a very useful memory viewing program which displays memory in colour coded sections for ease. Worth £8 on its own. Shadow + Inspector £8 inclusive.
Cheque to:
Clares Micro Supplies
Dept PCW, 222 Townfield Road, Winsford, Cheshire
Tel: (06065) 51374

SPRITE TRACK. For any Spectrum. New all-action game, the further you go the harder it gets. Superb Graphics, 100 per cent machine code, only £4.95. From James Fletcher, 29 Samuel Street, Warrington WA5 1BB.

K-TEL Doublesiders £5.95, Hobbit £11.95, Valhalla £12.95, Splat £4.50, post free. SAE for lists. Spectrum Vic20, CBM64, BBC. Dragon, Oric, ZX81 and NCC. 12 York Close, Barton, Bedfordshire, MK45 4QB.

TANGERINE MICROCAN, offers. UK101 8K toolkit Rom, etc, to highest bidder. Micropolis F.D. controller board, £20, Ascii keyboard £10, other computer odds and ends. Tel: Hugh Bridge 01-735 1862.

KEMPSTON JOYSTICK plus interface for sale, £20 ono. Many top titles for sale or swap, also new software wanted for Spectrum. Mike Russell, 10 Gwastod Terrace, Cwmtillery, Gwent NP3 1JY.

TORCH 280 DISC PACK for BBC micro with perfect software, £500; Micro Bytec standard colour monitor, £150; PL graphic lighter, £50. Tel: 0344 886178.

Continued on page 51

RICHARD SHEPHERD SOFTWARE

A HOME BUDGETING & BANKING SYSTEM THAT REALLY MAKES YOUR 48K SPECTRUM WORK!

A professional style multi function Cash Controller program that can load and make an entry in just 90 SECONDS . . . thanks to its ZX MICRODRIVE COMPATIBILITY. If you're not ready to upgrade to Microdrive yet, this easy to use cassette program can handle up to 400 transactions with your Spectrum, almost filling the 48K memory of your computer.

BANK ACCOUNT

- Statements on demand from any date to date.
- Holds up to 400 transactions.
- Standing order facility.
- All transactions can be automatically coded to allocate up to 16 budget headings.
- Search facility for any single item by description or amount.

HOME BUDGETING

- 16 budget headings, e.g. Gas, Rates, Car, Tax - you can choose the headings
- Highlights under/over spending
- Full budget expenditure breakdown
- Budget "re-think" facility

LOAN/MORTGAGE CALCULATOR

All you ever wanted to know but didn't like to ask! Calculates:

- **Interest rates**
- **Payback periods**
- **Capital sum**
- **Period of loan**

REMEMBER THIS CASSETTE CAN ALSO BE USED WITH ZX MICRODRIVE

- **PRINTOUT FACILITY USING ZX PRINTER**
- **FULL SECURITY WITH PERSONAL PASSWORD**
- **FULL SAVE PROGRAM ONTO CASSETTE OR MICRODRIVE**

Available from good computer stores or direct by mail order... **at a price that won't upset the Bank Manager!**

Credit Card Hotline (06286) 63531

FIRST FOR MICRODRIVE

Dealer enquiries welcome. Generous discounts.

PRIORITY MAIL ORDER

Please send me _____ CASH CONTROLLERS at £9.95 each including post & packing (overseas orders add £1.50).

Name _____

Address _____

_____

_____

I enclose cash/cheque/P.O. payable to Richard Shepherd Software.

Or credit my Access/VISA Card Number

Signature _____

MICRODRIVE CARTRIDGE NOT INCLUDED

RICHARD SHEPHERD SOFTWARE

ELM HOUSE, 23-25 ELMSHOTT LANE, CIPPENHAM, SLOUGH, BERKS. TEL. (06286) 63531

POPULAR Computing WEEKLY

12-18 January 1984 Vol 3 No 2

SUNSHINE

The Team

Editor
Brendon Gore
News Editor
David Kelly
Software Editor
Graham Taylor
Production Editor
Lynne Constable
Editorial Secretary
Cleo Cherry
Advertisement Manager
David Lake
Assistant Advertisement Manager
Alastair Macintosh
Classified Executive
Diane Davis
Advertising Production
Lucinda Lee
Administration
Theresa Lacy
Managing Editor
Duncan Scot
Publishing Director
Jenny Ireland

Popular Computing Weekly,
12-13 Little Newport Street,
London WC2R 3LD
Telephone: **01-437 4343**

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by Chesham Press, Chesham, Bucks

Distributed by S M Distribution London SW9. 01-274 8611. Telex: 261643

© Sunshine Publications Ltd 1984

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Registered at the Post Office as a newspaper

ISSN 0265-0509

How to submit articles

Articles which are submitted for publication should not be more than 3,000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your own program returned you must include a stamped, addressed envelope.

Accuracy

Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

News 5
Sinclair QL

Letters 7
Puzzle power

Star Game 10
Noughts & Crosses on Spectrum

Streetlife 13
David Kelly talks to artist Stuart Hughes

Reviews 14
ZX81 software by Andy Wilson

Spectrum 18
Machine code series — part 6

Programming 21
Laws of Motion by Roy Masefield

Dragon 24
Hi-res graphics by J Smith

BBC & Education 27
Graphic subroutines by D Cartwright

Commodore 64 34
Data transfer by Les Allen

Open Forum 39
Six pages of your programs

Microradio 45
Ray Berry's column

Adventure 47
Tony Bridge's corner

Peek & Poke 49
Your questions answered

New Releases 56
Latest software programs

This Week 58
Top 10 plus all this week's software

Competitions 59
Ziggurat, Puzzle, Losers

Editorial

The Games Centre, which went into liquidation last week, will be missed by games players everywhere. Together with its great rival, the Games Workshop, it provided a treasure house of board games, role playing games, electronic and even computer games.

Graeme Levin founded the Games Centre 10 years ago with a little shop in Hanway Street, London. He built it up to the point where it numbered nine different shops and turnover exceeded £4m. So, where did it all go wrong?

Ironically, according to Graeme Levin, part of the problems were caused by buying a computer. Misled by its reports, the Games Centre rapidly became overstocked with games that didn't sell. As a result, the Games Centre ran into severe cash flow problems.

The Games Centre was built around the idea of providing a focal point for gamers, with a shop manned and run by games enthusiasts. Perhaps, as the Centre grew and the business side became more important, some of that enthusiasm waned.

Graeme Levin, however, is unlikely to disappear. He co-authored the game *Speculate* and helped to bring games such as *Survive* and *Conspiracy* on to the market. His knowledge of games and the games industry is too valuable to waste.

There is obviously a market for shops such as the Games Centre as Games Workshop and the Video Palace have proved. But, it remains to be seen whether anyone will set up shop on as large a scale as the Games Centre.

Next Thursday

Next week's star game is Draughts for 16/48K Spectrum by David Cox — try to move the red counters to one side and the blue counters to the other.

Subscribe to Popular Computing Weekly

I would like to subscribe to *Popular Computing Weekly*.
Please start my subscription from the ..... issue.

UK Addresses: ☐ 26 issues at **£9.98** ☐ 52 issues at **£19.95**
Overseas Addresses: ☐ 26 issues at **£18.70** ☐ 52 issues at **£37.40**
Please tick relevant box
I enclose my cheque to *Popular Computing Weekly* for .....

Name .....

Address .....

.....

.....

Please send this form, and cheque, to *Popular Computing Weekly*, Subscription Dept., 12-13 Little Newport Street, London WC2R 3LD.

BBC ACORN
SINCLAIR
COMMODORE
ATARI
DRAGON
TEXAS
ORIC
PLUS MANY OTHER LEADING MAKES

Lion House has been established in Central London for over five years and is now London's largest computer store, uniquely placed to offer all you need to make the most of the micro.

Under one roof we offer everything you need for home and business computing. A complete range of the best computers and video games, together with the largest selection of software, books, peripherals and accessories. Backed up by expert advice and in-house service, we have the expertise to meet all your computer needs.

- **Home computers**
- **Complete business systems**
- **Wide selection of add-ons**
- **Largest range of software**
- **Largest selection of computer books available**
- **Fully qualified after-sales service**
- **Impartial expert advice**

LION MICROCOMPUTERS
AT LION HOUSE Open Mon. to Sat. 9.30–6.00
227 Tottenham Court Road, London W1P 0HX
Tel: 01-637 1601 & 580 7383 Telex: 28394 LION G
Also at 21 Bond Street, Brighton. Tel: (0273) 601838

Commodore

Continued from page 1

volume levels, programmable as either two music channels or one music and one white-noise channel. The full-size full-travel 67-key keyboard includes four pre-programmable function keys (giving up to eight user-defined keys when used together with the *Shift* key).

Software in the Commodore 264 Rom provides a full upper- and lower-case character set, built-in machine-code monitor and 'window' graphics capability. Spreadsheet, word-processing, file-handling and graphics software is available either as a built-in option or as a range of plug-in cartridges. Using the 'windowing' facility, for example, both spreadsheet and word-processing information can be viewed simultaneously.

The price of the 264 has yet to be finalised but it is expected to sell in the US for under $500 (about £335). It is scheduled to go on sale in the States from April 1 this year and it is hoped that it will arrive in Britain in May or June.

Commodore's other machine is the Commodore V364. Very similar to the 264, this computer includes a built-in speech synthesizer with a vocabulary of over 250 words, accounting for its increased Rom size of 48K. Additional vocabulary can be soft-loaded from cartridge or disc. The V364 also features an 86-key keyboard including a 19-key numeric paid.

Sinclair QL

Continued from page 1

64 QL or Spectrum computers to be linked.

The Sinclair QL is 19 inches long and 5½ inches wide, with a full-size professional quality keyboard. It has tv and RGB monitor outputs and RS232C and twin joystick ports. Ram is expandable from 128K up to 640K. Although the 68000 chip is externally 16-bit, its internal architecture is 32-bit, making the QL considerably faster than an 8-bit chip such as the ZX80 (Spectrum) or 6502 (BBC and Commodore 64).

As is now traditional for new Sinclair products, the QL will be available initially only by mail-order.

Oric 2 makes its debut

ORIC will launch its new home computer — the Oric 2 — at the Which Computer? Show to be held at the NEC in Birmingham between January 17 to 20.

The machine will be very similar to the Oric 1 except it will feature a better keyboard.

The Oric 2 will have 48K Ram and be based on the 6502 8-bit processor. All Basic programs written for the Oric 1 will run without alteration on the new machine.

The price of the new machine is expected to be around £160.

Networking from Acorn

ACORN has announced a local area networking device for laboratory equipment.

The new IEEE Interface for the BBC computer is capable of addressing and controlling up to 14 devices – oscilloscopes, voltmeters, Spectrum analysers and other such equipment – compatible with the IEEE electrical standard.

*The interface unit plugs into the 1MHz bus on the BBC micro and software to drive it, adding some 27 new commands to BBC Basic, comes on a Rom which plugs into the sideways Rom-slot on the BBC machine. The interface is then addressed using the command *IEEE.*

Priced at £325, the IEEE Interface will find application mainly in research laboratories, colleges and schools.

Left out in the cold

PRISM is offering a new service for micro owners who feel their machines are left out in the cold after the manufacturer's guarantee has expired.

For £14.99 a year Prism will cover the cost of repairs to any micro which retails at under £250; for £24.99 the cover is extended to include any machine costing up to £500.

Details from Prism Micro Care, Wellington House, Ashford Road, Maidstone, Kent.

Murdoch bid for Warner

RUPERT Murdoch is still continuing with his plans to gain control of Warner Communications — of which the ailing Atari computer company is a division.

He has indicated his intention to increase his stake from 6.7 percent up to 49.9 percent. For such a move he will need to raise somewhere in the region of $900m.

Launched into orbit

SURREY University is to launch a new satellite into orbit in March.

This satellite, like the first (see *Popular Computing Weekly*, Vol 2 No 39) will be for use by amateur radio enthusiasts with computers who will be able to receive orbital data broadcast by the device as it circles the earth.

The satellite itself, standing about three feet tall, contains its own microcomputer built around the 1802 chip with 48K of Ram.

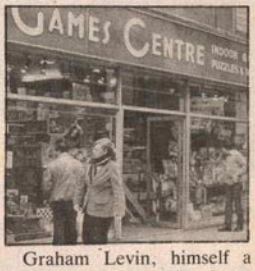
Roger Peel, software engineer on the £350,000 project, said: "The new device will have better computing and telemetry than the earlier one which only had 16K onboard." The satellite stores information about temperature and magnetic field strength as it orbits the earth from pole to pole, transmitting data recorded over a whole orbit in short bursts. The increased memory of the new satellite means that more information will be able to be collected and transmitted to radio amateurs.

The satellite will be launched in March from an American Delta rocket.

Games Centre stores go under

THE Games Centre chain of specialist games shops has gone into liquidation.

The nine stores were claimed by their founder Graham Levin to have the largest range of puzzles and games anywhere in the world. The shops also specialised in selling home computers, video games machines and associated games software.



Graham Levin, himself a keen games enthusiast, opened his first store in 1974. Last year the chain had a combined turnover of more than £4m.

The decision to put the Games Centre company into liquidation was blamed by Graham Levin on 'bad cash-flow problems'. Since 1982 the company had been expanding very rapidly, opening seven of the nine stores in the last two years.

Colour monitors for micros

MICROVITEC has announced two new colour monitors — a 14-inch and a 20-inch, compatible with most home micros.

The models will operate in either of two modes, handling a standard PAL-encoded tv picture output with sound or taking an RGB monitor output from the computer.

The 14-inch is priced at £259 and the 20-inch costs £349. Details from Microvitec, Futures Way, Bolling Road, Bradford, W Yorks.

A lifetime of games in one program!

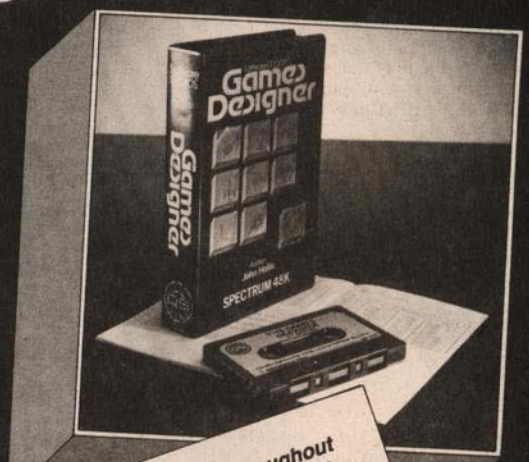
CREATE & PLAY YOUR OWN ARCADE GAMES! Simple to use

Software STUDIOS

Games Designer

By John Hollis
Author of Time Gate, Aquaplane and Meteor Storm.

Invaders format Asteroids format
Defender format & Beserk format



8 GREAT GAMES INCLUDED:
Turbo Spider · Tanks a lot · Halloween · Attack of the Mutant Hamburgers · Cyborg · Reflectron · Splot and Q-Bix

Smooth Arcade quality throughout using full colour sprites • Design your own fully animated Aliens, Ships, Missiles, Explosions • Full attack wave design (8 waves per game) • Moving background option • Full sound generation • Full movement control and scoring • Save and load YOUR OWN games to and from tape!

£14.95
SPECTRUM 48K
Dealer enquiries welcome.

Marketed exclusively by Quicksilva

Games Designer	£14.95
Time Gate (48K Spectrum)	£6.95
Aquaplane (48K Spectrum)	£6.95
Meteor Storm (16K Spectrum)	£4.95

I enclose cheque/P.O for_____
Please send me details of the Quicksilva Game Lords Club ☐
My Game Lords Club membership number is_____

Name_____
Address_____
_____

Cheques payable to Quicksilva Ltd.

Send to Software Studio, Quicksilva Mail Order, P.O. Box 6, Wimborne, Dorset BH21 7PY.
Telephone: (0202) 891744

Boots, W.H. Smiths, J. Menzies, Microdealer, HMV, Hamleys, John Lewis Computers for All and all reputable specialist computer stockists.

SPECIAL OFFER

Quicksilva Game Lords Club Members
£1.00 off Games Designer and £1.00 off Aquaplane and other NEW Quicksilva Games – call for details. Quote your secret membership No. on the order coupon.
Exclusive chance to Quicksilva Games Lords Club members to have their OWN games design published! Details coming soon!

GSH

Puzzle it out

My office colleagues and I all own Spectrums and look forward every week to the puzzle in your magazine. Indeed, we have a competition to see who gets the answer first and also the quickest time when the program is run.

In an attempt to get the quickest time we came upon something your readers may be interested in — when raising anything to a power, it is much quicker and much more accurate to multiply numbers together than to use the power function ↑, ie B * B is better than B ↑ B.

Type in the following programs and see the difference in time. Using the ↑ function takes 13 times longer than multiplying together:

Program 1
10 for n = 1 to 100
20 let z = n ↑ 2
30 next n
Runs in 13 secs

Program 2
10 for n = 1 to 100
20 for z = n * n
30 next n
Runs in 1 sec

Now insert: line 25 *if z = 10000 then print z*. You will see that program 1 will not print anything, whereas program 2 will print 10000.

David Senior
West Yorkshire

Violence and mayhem

Seeing my pal and patron, Mel Croucher, slagged in print the other week by a couple of your readers who seemed to think he was guilty of some hypocrisy for condemning aggressive games in the same magazine which carries a comic-strip style advertisement for his firm, Automata, depicting (nay, revelling in) scenes of torture, deceit, violence, etc, I feel bound, as the artist, to spring to his defence here.

It is assumed that Mel actually writes the scripts for these diversions. This is partly true. He passes these scripts to me. I take them to my studio, read them and throw them away. Then I write something entirely different, spiced with much jolly violence and mayhem.

I present the artwork to Automata on the last possible day, in fact at the very last possible minute, leaving no time for corrections or amendments. Heh, heh. I don't know how I've got away with it for so long. I have a feeling that there's a plot going on, so if I "disappear" soon, you'll know who to point at.

I think that Mel, Christian, the PiMan and all at Automata

are pursuing a very laudable cause. I don't know about James Hickman (15) of Northampton, but I'm glad somebody's into spreading joy and happiness across the planet . . . but that doesn't mean to say they're gonna stop me! Oh, and to those of you who think the cartoons are irritating and childish, all I can say is, 'yah boo sucks rasp to you guys'!

Robin Grenville Evans
Hampshire

A sense of humour?

Enough of this high score nonsense on your letters page. Let's get some real computing correspondence going. I've had an idea.

Clive sold 100,000 ZX80s. For those who know not, a ZX80 is like a Spectrum, but two years earlier, without colour, sound or graphics, without most of the Basic, without decimal points and without a keyboard (well, almost). So, where are they now?

For every 10 Spectrums in the world there is a ZX80 . . . somewhere. Are any still in use? Have you any theories as to their whereabouts? Most of all, did any of the *PCW* readers ot today own a ZX80 in the days of the soldering iron?

Awaiting further correspondance, I shall kick off. My ZX80 was a Chrissy pressy in 1980. 1K was small even then, so I bought a 16K Ram pack. The 4K Rom could not be helped.

It was the first computer under £100 and I was amazed at its great capabilities. It was running a (laughable) invader game within three days. Within three months I learnt machine code on it — then the ZX81 came out.

My Ram pack was pressed into service on my (handbuilt) ZX81 and the ZX80 gathered dust for a whole year, until I met a Sharp MZ80K owner. He had worked out that his 80K, presently working on a Z80 cpu, could tolerate the extra speed of the Z80A. So, my ZX80 got butchered and for a nominal £1 sold its heart to the Sharp. The rest of the psb went to an electronics freak who said he could make good use of the chips. And that was that.

Come on ZX80 owners. Show yourselves.

Mike Hampson (veteran)
7 Hereford Drive
Clitheroe
Lancs

ZX80 owners

I write in reply to L Hewelly re: Deviant Ways, Letters, *PCW* Vol 3 No 1. First, the Losers cartoon is not simply there for the less able computer users as many people with quite formidable intellect and ability have a sense of humour unlike, it seems, L Hewelly.

Regarding the field of educational software, this is still very much in its infancy with very few educationalists actively participating in programming. To say that games

"Ah well! It was fun while it lasted!"

writing is more educational than educational software writing is ludicrous, as educational software is closer in general structure and technique to real business software than games. I have personal experience of young children using appalling structures due to taking short cuts and the trend for developing games at the keyboard.

Whilst in the area of structured programming, I would like to advocate that some magazine space be designated for the more noble of the programming languages, specifically Pascal which BBC Basic tries so hard to emulate. The inclusion of a Pascal column would be universally appreciated as Pascal, unlike Basic, is extremely portable and many of the more popular micros now support this language.

When L Hewelly refers to the Spectrum as a "hideous little plug socket" he shows very little of the intellect he exhibits elsewhere in his use of English grammar. All micros have their strong and weak points. The Spectrum is an idea first computer with its excellent manual and low initial cost. The BBC makes an exellent second micro due to its expansion possibilities, complexity and many superior features. Thus the role of the Spectrum more than warrants the amounts of simpler literature printed for it, not forgetting however that many extremely experienced users do in fact own Spectrums.

The comments about Automata are, in my view, uncalled for as Automata make a worthwhile contribution to *PCW* in providing some very good light entertainment.

Finally, (no quips please), high score tables. There is a large amount of interest shown in these so surely (remember democracy?) it must be the duty of *PCW* to provide for its readers if suitable means and safeguards can be found.

I join L Hewelly in wishing everyone a happy new year.

D J Parrot
61 Warrington Road
Dagenham
Essex

A Pascal column is an interesting idea, but perhaps a general language column would be of more widespread use.

SITUATIONS AVAILABLE AT

IMAGINE SOFTWARE LTD is the largest and most successful game software house outside of the U.S.A. with more than 100 staff occupying 19,000 square feet of premises throughout Liverpool. Imagine Software are at the forefront of todays exciting software industry. As a result of Imagines' advanced and imaginative expansion program the following positions have become available. In all cases renumeration is commensurate with ability and seniority and is above industry standards. In many cases a new car and numerous fringe benefits will be part of the package. Relocation assistance will be given to successful candidates wherever needed.

SENIOR SOFTWARE MANAGER

A position exists for a Senior Manager who will be responsible for several departments working in diverse areas of software design and production. Applicants must have proven experience in commercially orientated software environments and a wide range of technical knowledge and skills.
This is a very senior position with many exciting and rewarding aspects. Career prospects are excellent.

SOFTWARE MANAGERS

Two positions exist to manage large software departments at the forefront of the games industry.
Applicants must have a proven knowledge and interest in computer games. A wide range of software skills and experience in managing programming staff.

SOFTWARE ARTISTS/GAMES PROGRAMMERS

Eight positions are available for programmers with both the technical ability and the creative skills needed to invent and code best selling games.
Fluency in at least one assembly language, artistic ability plus proven experience are the necessary qualifications. The successful applicants will be working in an innovative environment with the best available development software and equipment and will be provided with a high level of technical back up. This is the ultimate career opening for games programmers.

SYSTEMS SOFTWARE PROGRAMMERS

Two positions exist for systems software programmers working on very advanced products. Both positions are exciting and innovative.
For the first, applicants must be fluent in the 'C' language and MCS68000 assembler and be familiar with Unix type operating systems.
Applicants must be able to demonstrate a wide knowledge of advanced development tools.
The second position requires a fluency in pascal and MCS68000 assembler and familiarity with the UCSD operating system.
Experience of computer graphics and general business orientated applications software will be an advantage.

PROGRAMMERS

Thirty positions exist for programmers working in a team environment on many diverse aspects of microcomputer software, including the conversion and adaption of games to new microcomputers.
Applicants should be fluent in at least, one assembly language and have great familiarity with at least one currently popular consumer microcomputer. Experience is not necessary but provable ability is a qualifying factor.

GRAPHICS PROGRAMMERS

Two positions are available for programmers with skills, experience and knowledge of microcomputer graphics as applied to games software.
Applicants must be fluent in at least one popular microcomputer assembly language and preferably have a working knowledge of one other, plus familiarity with currently available microcomputer capability. Provable experience and/or ability essential.

COMPUTER MUSICIANS

Two openings are available for programmers who have the ability to write music and sound effects for popular micros.
The applicants must have a good knowledge of an assembly language and proven musical skills.

GAME DESIGNERS

Two positions exist for game designers to design a wide variety of entertainment software. Applicants will have both experience in general games design and theory plus a working knowledge of microcomputers.

TECHNICAL WRITER

An opening exists for a technical writer to prepare software manuals for both commercial products and internal development tools.
A recognised writing qualification will be necessary for applicants as will a very wide working knowledge of microcomputers.

GRAPHIC ARTISTS

There are six positions available for artists working on games design and production using computer based graphic tools.
A knowledge of microcomputer graphics plus excellent artistic skills are the qualifications for these positions.

Applicants should in the first instance send thier C.V. to:
PERSONNEL DEPARTMENT, IMAGINE SOFTWARE LIMITED
IMAGINE HOUSE, 5 SIR THOMAS STREET, LIVERPOOL L1 6BW
or ring for an application form:– **051-236 8100 (20 lines)**

RETAILERS

For fast speedy distribution service contact Drake Distribution on 0752 671606

We can offer you:

- ★ 24-hour delivery in UK
- ★ The Best Discounts
- ★ Starter packs available
- ★ All the latest software
- ★ Personal weekly delivery service throughout the UK
- ★ Export enquiries welcome
- ★ 48-hour delivery can be arranged

As retailers ourselves we know the titles that sell. — Phone or write for a price list now

DRAKE DISTRIBUTION
36 NEW STREET
BARBICAN
PLYMOUTH

ORIC1 48k DELTA 4

A superb Arcade game in 4 parts
written by Andy Green

SPACE INVASION
CROSSFIRE
COSMIC GUERILLAS
MISSILE COMMMAND

SUPERB ★★★★★ GAMES

32 levels of difficulty available. From all good stockists or direct from

NECTARINE

837 Yeovil Road, Slough SL1 4JH
Send **£9.60** incl p&p

MISSION·1

BECOME A SECRET AGENT

PROJECT VOLCANO

Mission Software's complete package on Project Volcano, is probably the most advanced Adventure Computer Game Package you have considered this year. It is not just for the dedicated game player but for those that want to get involved in Secret Codes – Messages, and the seamy-side of DI6 (British Intelligence) and the K.G.B.
IT IS A MUST FOR THE SINCLAIR SPECTRUM 48K AND DRAGON 32 HOME COMPUTER OWNERS.
When you receive your Adventure Game from Mission Software Limited, included in the package is your Passport to the international workings of the Secret Agents.
Your personalised Passport will assist you in negotiating the K.G.B. network in the Soviet Block Countries and vital to the success of your mission.
Command Headquarters will give you information that other Agents have recorded, together with their Communication Log, Mission Instructions, Secret Memos, Classified Diagram, Full Briefing Instructions and other Secret Data.
IT'S UP TO YOU TO BREAK THE CODE AND BECOME A SUCCESSFUL SECRET AGENT.
We rely upon our Agents to feed back information to make further projects interesting and complex, to tax your ability and to guarantee many hours of enjoyment.
We believe Mission Software Limited is the only company that supports its Field Agents with a mass of Secret Information to make the Mission exciting and enjoyable which makes it a must in Computer Games.

- We know your friends will want to become Secret Agents and use your game, we will be quite happy to supply them with their Passport and Documents for £2.95 per kit. This way you always retain your personal Passport and Secret Information.
- The moment you tell us you have completed your current assignment we will advise by Secret Data, details of how to penetrate one of the World's most secret establishments.
- To obtain your Game and personal Passport with all its Secret Documents send a Cheque or Postal Order for £6.95 (inc. P.P. & V.A.T.) with the Coupon at the foot of this advertisement.

ORDER MISSION 1 TODAY AND JOIN THE GROWING NUMBER OF SECRET AGENTS OPERATING FROM COMMAND HEADQUARTERS.

£6·95
Inc. P.P. & V.A.T.

MISSION SOFTWARE LIMITED
COMMAND HEADQUARTERS · 1st FLOOR
49 GRANGE ROAD · DARLINGTON · Co. DURHAM
DL1 5NB · TELEPHONE (0325) 483344

NAME .....

ADDRESS .....

.....

.....

PLEASE SEND ME MISSION 1 FOR MY (TICK AS APPLICABLE)
DRAGON 32 ☐ SINCLAIR SPECTRUM 48K ☐
EXTRA PASSPORT CODE-BREAKER £2.95 ☐
I ENCLOSE MY TOTAL REMITTANCE OF £.....
CHEQUES AND POSTAL ORDERS MADE PAYABLE TO MISSION SOFTWARE LIMITED

MISSION SOFTWARE LIMITED · COMMAND HEADQUARTERS · 1st FLOOR · 49 GRANGE ROAD · DARLINGTON DURHAM · DL1 5NB · TEL. (0325) 483344

CVG 2

Noughts and Crosses

A new game for 16K or 48K Spectrum by Barry Ashfield

In this version of Noughts and Crosses you are given the option of playing against the computer (Clive) or you can select the two player mode and play another person. In the two player game the player who inputs the first name will have the first go and will be nought. In following games the first go alternates between players, scores are kept and displayed on the right of the screen. To make a move just select the number of the square and press enter.

Playing against the computer you have a choice of levels (hard or very hard) and you are given the first go with nought. If you should defeat the computer the learning routine is brought into action and you will have to try another trick next time!

The learning routine works by storing the sequence of moves in g$. If the game results in a defeat or a draw (Clive's first turn only) the contents of g$ are transferred to c$ and remembered. If the same sequence is encountered in a later game a different move is made, so the longer you play the harder it becomes to win.

It is possible to keep this information by *Saving* "oxo" LINE 40. On reloading the game will continue where you left off. 16K users should delete all REM statements. It is possible on 48K machines to make c$ larger, but note that Line 42 (wdr) will need alteration as well.

Notes

1-200	Draws Screen and sets up variables
200-220	Alternates turn
500-570	Input move and DATA for printing X or O
1000-1110	Check for win or draw
2000-4030	Computers move
5000-6050	Draw NOUGHT/CROSS
6100-6430	Draw win lines
7000-7250	Score/next game
9000-9200	Start game/choose level
FNm()	generates random move
FNu ()	checks for best move
won	players score
lost	Clive's score
drawn	number of draws
c$	stores winning moves
b$	checks for new move
g$	stores current moves
u$	check win/draw/lose
f$	first player's name
s$	second player's name
vh	game level
two	1 or 2 players
ch	change turn
wdr	value of c$
xoro	nought or cross
m$	input move
m	computers move

```
  1 REM NOUGHTS AND CROSSES REM
   **** BY BARRY ASHFIELD *****
   ******* © July 1983  ******
  3 PAPER 7: INK 0: BORDER 7: C
LS
  5 POKE 23561,0: POKE 23617,16
4: POKE 23609,50: LET vh=0: LET
two=0: LET ch=3
  10 LET wdr=0: LET won=0: LET l
ost=0: LET drawn=0: GO TO 9000
  15 DEF FN m()=INT (RND*9)+1
  20 DEF FN u()=CODE u$(a)+CODE
u$(b)+CODE u$(c)
  30 DIM c$(100,9)
  40 DIM b$(9): DIM u$(9): DIM g
$(9)
  42 IF wdr=100 THEN LET wdr=0
  45 CLS : LET count=0
  50 REM  DRAW GAME FRAME  REM
  60 LET a$="
  70 PRINT INK 7; BRIGHT 1;AT 5,
0;a$;AT 11,0;a$
  80 FOR a=0 TO 16
  90 PRINT INK 7; BRIGHT 1;AT a,
5;"";AT a,11;""
 100 NEXT a
 110 PRINT AT 2,2;"1";AT 2,8;"2"
;AT 2,14;"3"
 120 PRINT AT 8,2;"4";AT 8,8;"5"
;AT 8,14;"6"
 130 PRINT AT 14,2;"7";AT 14,8;"
8";AT 14,14;"9"
 140 INK 1: FOR a=52 TO 132 STEP
 40
 150 PLOT 164,a: DRAW 88,0: DRAW
 0,32: DRAW -88,0: DRAW 0,-32
 160 NEXT a: INK 0
 170 PRINT BRIGHT 1; INK 1; PAPE
R 9;AT 2,21;f$;AT 4,27;won;AT 4,
22;" WON "
 180 PRINT BRIGHT 1; INK 2; PAPE
R 9;AT 7,21;s$;AT 9,22;" WON ";A
T 9,27;lost
 190 PRINT PAPER 4; BRIGHT 1;AT
13,22;"DRAWN ";AT 13,28;drawn
 200 REM     CHANGE TURN     REM
 210 IF count=0 AND ch=1 THEN LE
T ch=0: LET xoro=6000: GO TO 500
 220 IF count=0 AND ch=0 THEN LE
T ch=1: LET xoro=5000: GO TO 200
0
 500 REM     MAIN LOOP     REM
 501 IF xoro=6000 THEN LET I=1
 502 IF xoro=5000 THEN LET I=2
 505 PRINT AT 21,0;"
 506 IF two THEN PRINT BRIGHT 1;
 PAPER 9;AT 21,0; INK I;f$+"( NO
UGHT )" AND xoro=6000;s$+" ( CRO
SS )" AND xoro=5000
 508 IF two=0 AND xoro=6000 THEN
 PRINT BRIGHT 1; PAPER 9; INK I;
AT 21,0;f$;" ( NOUGHT )"
 510 INPUT BRIGHT 1; PAPER 9; IN
K I;"  Your move  "; BRIGHT 0;"
```

```
"; LINE m$: IF CODE m$<49 OR CO
DE m$>57 OR LEN m$>1 THEN GO TO
510
 511 IF u$(VAL m$)<>" " THEN GO
TO 510
 513 IF two AND xoro=5000 THEN G
O TO 521
 514 LET g$(count+1)=CHR$ (64+VA
L m$): LET u$(VAL m$)="0"
 515 GO TO 530
 520 LET i=2: LET m$=STR$ m
 521 LET g$(count+1)=CHR$ (96+VA
L m$): LET u$(VAL m$)="1"
 530 RESTORE 530: DATA 5,141,20,
156,2,2,53,141,68,156,2,6,102,14
1,116,156,2,14
 531 DATA 5,93,20,108,6,2,53,93,
68,108,6,6,102,93,116,108,6,14
 532 DATA 5,45,20,60,14,2,53,45,
68,60,14,6,102,45,116,60,14,14
 540 FOR n=1 TO VAL m$
 550 READ x,y,p,q,x1,y1
 560 NEXT n
 570 PRINT AT x1,y1;" ": GO SUB
xoro
1000 REM    CHECK FOR WIN  REM
1010 RESTORE 1010: DATA 1,2,3,2,
0,4,5,6,8,0,7,8,9,14,0,1,4,7,2,1
00,2,5,8,6,100,3,6,9,14,100,7,5,
3,0,200,1,5,9,0,300
1020 FOR f=1 TO 8
1030 READ a,b,c,d,line
1040 IF u$(a)<>" " AND u$(a)=u$(
b) AND u$(a)=u$(c) THEN GO TO 61
00+line
1050 NEXT f
1060 LET count=count+1
1070 IF count=9 THEN LET drawn=d
rawn+1: PRINT BRIGHT 1; PAPER 4;
AT 13,28;drawn
1075 IF two=0 AND count=9 AND xo
ro=6000 THEN LET wdr=wdr+1: LET
c$(wdr)=g$
1090 IF count=9 THEN PRINT FLASH
 1; BRIGHT 1; PAPER 9; INK 1;AT
19,3;" DRAWN GAME "; FLASH 0;AT
21,0;"PRESS ENTER TO TRY AGAIN
": PAUSE 0: CLS : GO TO 40
1100 IF xoro=5000 THEN GO TO 200
0
1110 IF xoro=6000 THEN GO TO 500
2000 REM   COMPUTERS TURN  REM
2010 IF two THEN GO TO 500
2020 LET inc=3100
2030 PRINT FLASH 1; BRIGHT 1; PA
PER 9; INK 2;AT 21,0;"    Clive i
s thinking "
2040 IF u$="                " THEN LET
m=FN m(): GO TO 520
2050 LET ret=1: GO TO 2500
2100 REM  COMPUTER LEARNS  REM
2105 IF count=8 THEN GO TO 2500
2106 IF wdr=0 THEN GO TO 2260
2107 LET a$=""
2110 FOR W=1 TO wdr
2120 LET z=count
2130 IF g$( TO Z)<>c$(W, TO Z) T
HEN NEXT W
2140 IF g$( TO Z)=c$(W, TO Z) TH
EN LET a$=a$+c$(W,Z+1)
2150 NEXT W
2160 IF count>1 AND LEN a$=0 THE
N GO TO 2500
2170 FOR F=1 TO LEN a$
2180 FOR a=1 TO 9
2190 IF a$(F)=CHR$ (96+a) THEN L
ET b$(a)=CHR$ (48+a)
2200 NEXT a
2210 NEXT F
2220 LET L=0: FOR F=1 TO 9
2230 IF CODE b$(F)=32 THEN LET L
=L+1
2240 NEXT F.
2250 IF L=1 THEN DIM b$(9)
2260 IF count>1 OR vh=0 THEN GO
TO 2280
2265 LET m=FN m() AND u$(5)="0":
 IF m=1 OR m=3 OR m=7 OR m=9 THE
N GO TO 2290
2266 IF u$(5)="0" THEN GO TO 226
5
2270 IF vh AND u$(5)=" " THEN LE
T m=5
2275 GO TO 520
2280 LET m=FN m()
2290 IF CODE b$(m)<>32 OR u$(m)<
>" " THEN GO TO 2280
2300 GO TO 520
2500 RESTORE 2550
2510 FOR n=1 TO 8: READ a,b,c
2520 GO SUB inc
2530 NEXT n
2540 LET inc=inc+100
2545 IF inc=3300 AND ret=1 THEN
LET ret=0: GO TO 2100
2550 DATA 1,2,3,4,5,6,7,8,9,1,4,
7,2,5,8,3,6,9,1,5,9,3,5,7
2560 GO TO 2500
3100 REM CHECK X X - REM
3110 IF FN u()=130 THEN GO TO 40
00
3125 RETURN
3200 REM CHECK 0 0 - REM
3210 IF FN u()=128 THEN GO TO 40
00
3240 RETURN
3300 REM CHECK X - - REM
3310 IF FN u()=113 THEN GO TO 40
00
3340 RETURN
3400 REM CHECK 0 - - REM
3410 IF FN u()=112 THEN GO TO 40
00
3430 RETURN
3500 REM CHECK X - 0 REM
3510 IF FN u()=129 THEN GO TO 40
00
3540 RETURN
4000 REM RANDOM NUMBER REM
4010 LET m=FN m(): IF u$(m)<>" "
 THEN GO TO 4010
4020 IF m=a OR m=b OR m=c THEN G
O TO 520
4030 GO TO 4000
5000 REM     DRAW CROSS     REM
5005 INK 2
5010 PLOT x,y: DRAW 30,30
5020 PLOT x,y+1: DRAW 30,30
5030 PLOT x,y-1: DRAW 30,30
5040 PLOT x,y+30: DRAW 30,-30
5050 PLOT x,y+31: DRAW 30,-30
5060 PLOT x,y+29: DRAW 30,-30
5065 BEEP .1,15
5070 INK 0
5095 LET xoro=6000
5100 RETURN
6000 REM    DRAW NOUGHT     REM
6010 FOR a=14 TO 15
6020 CIRCLE INK 5;p,q,a: CIRCLE
INK 5;p+1,q,a
6030 NEXT a
6035 BEEP .1,0
6040 LET xoro=5000
6050 RETURN
6100 REM DRAW WINNING LINES REM
6105 REM  1-2-3:4-5-6:7-8-9  REM
6110 FOR f=0 TO 16: PRINT FLASH
1; INK 5; PAPER 2;AT d,f;"■"
6120 BEEP .05,f*2: NEXT f
6130 GO TO 7000
6200 REM  1-4-7:2-5-8:3-6-9  REM
6210 FOR f=0 TO 16: PRINT FLASH
1;  INK 5; PAPER 2;AT f,d;"■"
6220 BEEP .05,f*2: NEXT f
6230 GO TO 7000
6300 REM      7-5-3      REM
6310 FOR f=16 TO 0 STEP -1
6320 PRINT FLASH 1; INK 5; PAPER
 2;AT f,d;"■": BEEP .05,f*2
6325 LET d=d+1
6330 NEXT f
6340 GO TO 7000
6400 REM      1-5-9      REM
6410 FOR f=0 TO 16: PRINT FLASH
1; INK 5; PAPER 2;AT f,f;"■"
6420 BEEP .05,f: NEXT f
6430 GO TO 7000
7000 REM NEXT GAME / SCORE REM
7010 PRINT BRIGHT 1; INK 1; PAPE
R 9;AT 21,20;"WON THE GAME"
7020 IF two=0 AND xoro=6000 THEN
 PRINT AT 21,0; INK 1; BRIGHT 1;
 PAPER 9;"     Clive          "
7100 IF xoro=5000 THEN LET won=w
on+1: PRINT BRIGHT 1; INK 1; PAP
ER 9;AT 4,27;won
7150 IF xoro=6000 THEN LET lost=
lost+1: PRINT BRIGHT 1; INK 2; P
APER 9;AT 9,27;lost
7160 IF two=0 AND xoro=5000 THEN
 LET wdr=wdr+1: LET c$(wdr)=g$
7250 PRINT #0; BRIGHT 1; INK 1;
PAPER 9;"PRESS ENTER TO PLAY AGA
IN": PAUSE 0: CLS : GO TO 40
9000 PRINT AT 3,6;"NOUGHTS AND C
ROSSES"
9010 PRINT AT 7,0;" PRESS c TO P
LAY THE COMPUTER "
9020 PRINT AT 11,0;"    PRESS t F
OR TWO PLAYERS "
9030 POKE 23658,0
9050 IF INKEY$="c" THEN GO TO 91
50
9055 IF INKEY$="t" THEN GO TO 91
00
9060 GO TO 9050
9100 LET ch=1: LET two=1: CLS
9110 PRINT AT 3,5;"NOUGHT WILL G
O FIRST"
9120 INPUT "First players name
                (up to 10 letters)";
f$
9125 IF LEN f$>10 THEN GO TO 912
0
9130 INPUT "Second players name
                (up to 10 letters)";
s$
9135 IF LEN s$>10 THEN GO TO 913
0
9140 GO TO 40
9150 INPUT "Your name please
                (up to 10 letters)";
f$
9155 IF LEN f$>10 THEN GO TO 915
0
9160 CLS : PRINT AT 8,0;f$;AT 8,
11;"WILL GO FIRST"; AT 10,12;"WIT
H NOUGHT"
9170 PRINT AT 15,0;"PRESS  h  for
 HARD" AT 17,0;"PRESS  v  for V
ERY HARD"
9180 PAUSE 0
9190 POKE 23658,0: IF INKEY$="v"
 THEN LET vh=1
9200 LET s$="Clive": LET ch=1: G
O TO 20
```

16/48

THE MONTHLY CASSETTE MAGAZINE
FOR THE 16K & 48K ZX SPECTRUM
TAPE Ø3 FEBRUARY/84 £2:99

NEW ADVENTURE
/THE LONG WAY HOME
FIRST CHAPTER

REVIEWS
/3D TANKS

EDUCATIONAL
/ELEMENTS

GAMES
/SPIDER
VORTEX

PROGRAM
AIDS
/RENUMBER
PIXEL
SCROLL

COMPETITION
/WINNERS

16/48 ISSUE 3

Introduces Chapter 1 of our new serialised adventure
THE LONG WAY HOME

With amazing (worth an upgrade), instant GRAPHICS for 48K machines. It has to be seen.

You can make sure of your copy and save money with our special UK Subscription Rates.
6 ISSUES £15 12 ISSUES £28

Please send me _____ issues of 16/48 starting with Issue No _____

NAME ADDRESS

POST CODE

Post to 16/48 Magazine Ltd, 10 Barley Mow Passage, Chiswick, London W4 4PH

Published by 16/48 Magazine Ltd., 10 Barley Mow Passage, Chiswick, London W4 4PH.
Distributed by SM Distribution, 16/18 Trinity Gardens, London SW9 8DX. Telephone 01-274 8611-15

Pickled eyes for tea

***David Kelly** talks to micro artist Stuart Hughes*

To a science-fiction illustrator, the home microcomputer boom is a dream come true.

The whole industry is absorbed with aliens, far-away galaxies and improbable androids. For those who make a living out of painting cassette inserts and book jackets, computers are a licence to be paid for having fun.

Surprisingly though, there are few artists who successfully make a living out of micros. Internationally known sci-fi artists like Jim Burns and Tony Roberts are out of the league of all but the very biggest software companies.

The top micro artists can almost be listed on the fingers of one hand — David John Rowe who does work for Quicksilva and Interface, Steve Blower with Imagine, Melvin Bagshaw, Ian Craig and Stuart Hughes.

Stuart has done paintings for both software houses — Sinclair, Artic, Softek, — and computer book publishers — Addison-Wesley, Granada and Sunshine.

Being a commercial artist is a job just like any other — and Stuart has to work pretty hard. He may do seven or 10 paintings a month. The companies he works for he calls 'clients'; they tell him what they want and he produces the goods, often to quite tight deadlines. If pushed, he can turn round a finished painting in three days.

He reckons that painting is a craft to be learned like any other. "There is this myth that people are born gifted — either you can draw or can't draw. It's not true. If you want to do something and you work at it you'll do it." The first day Stuart was at art college, in his home town Liverpool, set the tone for him. "The guy said take something out of your pocket and draw it. The only thing I had was a paper tissue.

"I drew that one tissue over and over for eight hours. If you spend that amount of time drawing and painting you get better at it."

After one year's foundation course Stuart then did a three-year degree course at Norwich. "After Liverpool, Norwich was a culture-shock. A friend of mine used to walk down the street swearing at people just to try to get a reaction — Norwich is very 'nice'."

The course wasn't to Stuart's liking either. "I was spending six weeks designing the title page of a book — I couldn't cope with that. After a year I just got on with painting and drawing.

"The course was not so much to do with what you could produce, but how you could talk about it. "When you do a painting people either like it or they don't — you shouldn't have to talk about it."

After Norwich, Stuart did teacher-training and then taught for a year in a junior school in Liverpool. He realised that he missed drawing and painting very much — he gave up, moved down to London and after a couple of months, started getting some work, mostly from girls comics.

He also started selling some of his slightly macabre surreal paintings — jars of pickled eggs with eyes, pig-shaped sausages on a plate.

"I always used to read science-fiction books but not to do sf art — my stuff was more strange, slightly surreal fantasy. I sort of fell into it by doing the early covers of *Popular Computing Weekly*, which Ian Craig and I shared between us."

Stuart paints on boards about A3 size, using an airbrush to create an almost photo-like realism. An airbrush uses a compressor to produce a fine controllable spray of paint. With the compressor going, painting is a noisy business and he has to wear a mask to prevent inhalation of the air-borne paint-spray. "The airbush is just like a can of spray paint, except you have far greater control over the size and pressure of the air jet.

"My aim is to be able to paint absolutely anything I can think up in such a way as to make it believable — you can believe there is a giant eye floating in the sky with a waterfall pouring out of it."

A new commission begins with the software company ringing up with the title of the game. Very occassionally, Stuart will see a pre-production version of the game — he has a 48K Spectrum and is a keen micro-enthusiast. "Then I just get on with other paintings — all the time thinking about the new game." Two ideas people help — friends Laura and Val.

The idea for Artic's *Inca Curse* came to Stuart in the pub. "It depends what I'm into at the time. When *Inca Curse* came along I was into skulls and bones."

The next stage is a rough pencil sketch and collecting references. Stuart draws mainly from photographs and has a filing cabinet stuffed with pictures of every conceivable object. When painting a face, he will often take a photograph of a friend which he then prints up himself to work from.

After the client has seen the rough sketch and given the go-ahead, the painting is started. Using the airbrush Stuart first puts down the background, masking off the main subjects — the skull in *Inca Curse*, for example — with acetate sheets.

Most of the rest of the painting is also airbrushed, with only the fine detail drawn with an ordinary paintbrush. Sometimes the details of faces are finished with oil paint, but that can take up to 10 days to dry. In many cases the liquitex acryllic paint of the airbrush is used throughout.

Stuart charges between £200 and £400 for a cassette cover, depending on the quality of work and time taken to do it. At present, Stuart rarely has time to spent more than four or five days on a painting. "It's hard work — prior to working for the micro industry I'd always spend more than two weeks on a picture, I've had to train myself to work faster.

In his spare time, Stuart is a keen runner. Until a knee injury cut short his running career at 17, he was the second fastest runner in the country for his age. He still runs when he finds time and he has taken up teaching again, one day a week at the local junior school. "I just paint, sleep, run and paint some more, with an occasional glass of beer.

"When I have a spare moment I play with the Spectrum. I'd like to be able to produce a computer version of a painting which could then be used on the screen as the game was loading."

Yet, two years ago, Stuart didn't know home micros existed. "I couldn't believe my luck when I was first asked to do sf paintings. I'm really enjoying myself — I just keep waiting for the bubble to burst.

"It's just me painting what I want to with nobody turning round at the end and saying 'You've got to put a moon in the sky' or add something else in. Those are the kind of hassles you get in more stable fields like children's books.

"I can see computer artwork becoming more like that — more stodgy — as the companies mature. Some of them have already got art directors. Even now some houses are beginning to concentrate on what they reckon will sell the product, rather than producing an image that is interesting or different.

"In the end they will lose out — just like anybody else, I work better if I feel involved. The aim is to end up with something both of us — me and the software house — are proud of.

"The great thing about computers is you can paint just what you want. I could paint flowers — neon flowers — and I'm sure I could sell it." ■

Echoes of a distant past

***Andy Wilson** sees in the new year with a round-up of ZX81 software*

When Clive Sinclair launched the ZX81 on an unsuspecting public, I wonder if he realised he was inadvertently creating a whole new industry?

Soon after the ZXs appearance, software houses started popping up everywhere. Previously, although it had been possible to obtain games on cassette for the Pet, ZX80 and TRS80, the market had been very small.

Reading the *Street Life* column in *PCW*, one soon becomes aware of how many companies started life writing games for the ZX81. Nowadays though, hi-res graphics, colour and sound are all the vogue — and the trusty old ZX81 is looking somewhat neglected. Although it is still selling steadily, very few companies are producing new software for the ZX81. If however you have just splashed out on a *Starter Pack* and are becoming bored with *Backgammon*, there are still quite a lot of games on the market.

One great challenge for programmers was writing games for the unexpanded 1K ZX81. With a full display file there are only 100 or so bytes to play with, so most attempts have been rather unsuccessful.

Micromega have tried to tempt the 1K ZX owner with their *Challenge* gamepack. The first thing one notices is that *Challenge* comes packed in a large box containing a large single-sheet instruction booklet and a small cassette. Delving around in the box for the cassette, we find it contains five machine code games. One of these, *Cartoon-man*, cannot really be called a game as it just consists of a nicely animated figure who can be walked across the screen at varying speeds. It held my attention for about a minute.

The little man appears again in *Juggler*. This time, his on-screen wanderings have a purpose. If you are quick with the keys, and manage to stay awake, you will find yourself juggling with *As* and *Us*. If you drop three the game is over. You may choose to play again, but this is unlikely.

Two of the games test your skills as a budding James Hunt. In *Brands Hatch* you are treated to a map of the famous race-course which you have to try to negotiate in record time. I spent most of my time spinning round in ever decreasing circles and disappearing up my own expansion port.

Road Race features an accurate map of the British Isles, with two roads between London and Scotland. According to the blurb, you can race your left hand against your right hand or challenge a friend. Alternatively, you could load the next game.

Meteor Strike is the only game on the tape that held my attention for more than a couple of minutes. Someone at Micromega is obviously a cartographer, because the game is based on an extremely good map of the world. This can be scrolled from side to side, in order to make the meteors falling from the top of the screen land in the sea. As this is almost impossible, I found it much more interesting to see which countries I could destroy first.

To start a new game with a new map you have to reload the whole game. This is a pain because, as with all the games on this tape, the ZX81 has to be switched off then on again. All in all, nice maps — shame about the games.

When you have made the inevitable upgrade to 16K, you could try buying *Galaxians* from Quicksilva. In this stripped down copy of the arcade original, you are attacked by swooping *Vs* and *Ws* which you fire at with an *A*. Surprisingly, the graphics are quite effective. The movement is fast and smooth, and you can get very involved in the game.

Wobbly birds and exploding eggs

Unfortunately, your base neither moves nor fires fast enough in comparison to your attackers to make it possible to defend yourself properly. I only managed to clear the first screen a few times, and that was with the easiest possible combination of options. You have a choice of speed, rate of fire and the number of swooping *Galaxians*.

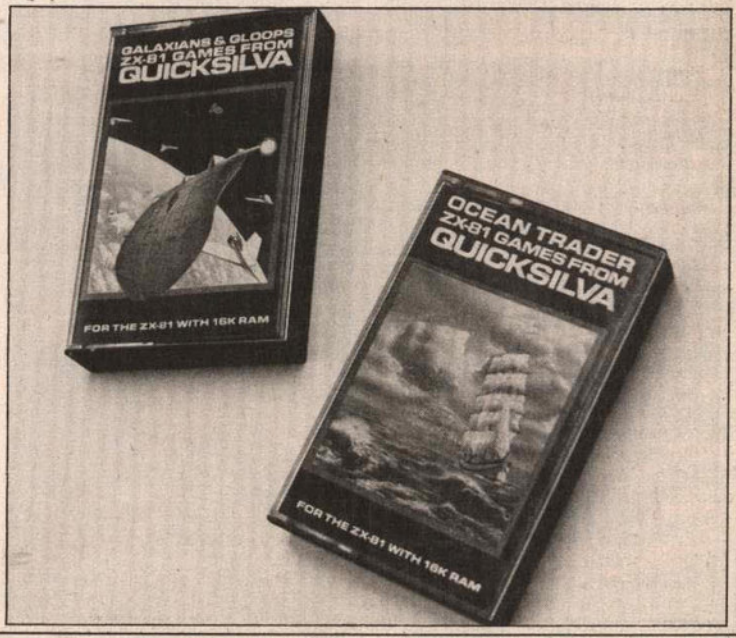
The demo mode is more fun to watch than usual as the game is different every time. If you manage to shoot a few *Galaxians* before you bite the dust, you can enter your initials on the lengthy hi-score table.

The most surprising thing about this game is the inlay blurb. You thought you were firing a laser cannon at alien spacecraft? Not in this game you're not! Your attackers are large wobbly birds dropping exploding eggs and your only defence is a dragon gut catapult.

The tape is also supposed to contain a second game, *Gloops*. As my review copy is devoid of anything remotely *Gloop*-like I do not feel in a position to comment. As for *Galaxians*, I loved the inlay blurb and the game wasn't bad either.

New releases for the ZX81 are rare nowadays, so *Door Slammer* from Cathedral Software is very welcome. On loading, you are presented with a nice flashing picture of, guess what — a cathedral, followed by optional instructions which run over five screens. The object of the game is to close all the cathedral doors by walking through them; stripped down, it's a bit like the old 'can you join the dots with x lines without taking pen from paper' type puzzle.

Added difficulty is provided by a ghost and a trapdoor. The ghost is totally invisible, and you don't know he's there until he slams you in the door, killing you instantly. It is well worth wandering round in the hope of being slammed, as you are treated



with a great picture of a smirking ghost crushing you 'twixt door and frame. If you manage to lock yourself in a room, you may be able to escape through the trap-

door, whereupon you reappear at random in another room. As the game is written in Basic it is rather slow, but as it is supposed to be a game of strategy rather than reactions, this doesn't matter too much.

A big fault in the programming is the hi-score table. As it uses the *Inkey$* routine for entering names, you have to use full stops instead of spaces. Although the game as a whole is a nice idea, after several plays I came to the conclusion that it is impossible, and started getting bored.

As an added bonus, the tape contains a machine code routine for inverting the screen which can be used in your own programs. As this routine is only a few bytes long, and has appeared in practically every micro magazine and book, its usefulness as a bonus seems limited. Nice thought though.

Another relatively recent release is *Astral Convoy* from Vortex, another game where the aliens have more in common with H G Wells' martians than with good old cuddly ET. In this universe, their evil little minds are intent on destroying a defenceless convoy. Defenceless that is apart from you, the gallant pilot of a well armed small white square.

Your mission is to blast those nasty, and probably slimy, aliens back to meet their creator. They try to hinder your task by depositing nasty spiked space mines. Hit one and it's your turn to chat with St Peter.

The keyboard layout takes some getting used to — the services of a good surgeon to rearrange the layout of your fingers might well make things easier. Most of my criticisms of this game might well stem from the fact that I wasn't very good at it. If alien zapping is your forté, you will probably enjoy it.

Maze Death Race from PSS is the only arcade game in this review that I keep returning to. It reminds me of *Rocket Chase*, a predecessor to *Pacman* in which you were chased round a maze by homing missiles while you tried to run over, or eat, all of the dots. In *MDR*, you are driving a racing car pursued by baddies in other cars who smash into you in a suicidal fashion. The maze is nine times the size of the screen and scrolls in four directions.

Fast, smooth and tense . . .

You have to try to run over 10 asterisks on each screen, and every time you complete a screen an extra chase car appears to make life more difficult. Fast, smooth and tense, I found it a joy to play. My only criticisms concern the almost total lack of instructions and the fact that it has to be loaded in two parts.

In general, not being very good at most arcade games I tend to prefer adventures. One of the earliest releases for the ZX81, and still featuring in the top 10 charts, was Psion's *Fantasy Games*.

There are two games on the tape. The first, *Perilous Swamp*, is really an introduction to the more advanced *Sorcerers Island*. In *Swamp* you wander round fighting monsters and trying to rescue a princess. The fights are arranged on a points basis and are rather unpredictable. The commands you can enter are very simple, either a compass direction or a decision to fight, run or bribe.

Island is much more challenging. You still fight monsters using your strength points and the commands are still very simple. Your aim is to escape from the island with the aid of various spells, medals and keys you find on your journey. A map of the island is available on request and you are kept informed of your immediate surroundings. The map is drawn in *Fast* mode, but seems to take forever.

Monsters range from mice, which invariably run away, to dragons, which don't, with other strange creatures popping up everywhere. Can anyone tell me what a Bunyip is? Although I prefer more traditional adventures, *Fantasy Games* is an ideal introduction to adventuring.

The last game in this review is *Ocean Trader* from Quicksilva. More of a simulation than an adventure, you play the part of a mercenary mariner, trading between five British ports. You paid for your ship with a loan from the finance company, who you will certainly have to visit again for capital. True to life, they charge exorbitant interest rates and, if you owe them too much, they will repossess your ship.

You select your cargo from goods on offer at the port and then set sail. Seagoing hazards include pirates, fog and storms, losing your cargo being the most common outcome of encountering any of these. If you reach the next port with cargo intact, you can choose to sell or buy.

The instructions are very lengthy and are loaded separately — if you have a printer, I advise you to list them. I played this game for hours and would recommend it to any budding capitalist.

There is still a lot of good software available for the ZX81, but watch out, there is a lot of rubbish as well. Highly recommended games not included in this review include Psion's *Flight Simulation*, Artic's adventures and, of course, the offerings from New Generation. Finally, a plea to all of the software houses, there are still a lot of us ZX81 owners out here, please don't forget us. ■

Firm	Program	Value (1-10)
Vortex Software 280 Brooklands Road Manchester M23 9HD	*Astral Convoy*	6
PSS 452 Stoney Stanton Road Coventry CV6 5DG	*Maze Death Race*	9
Cathedral Software The Lodge Brandon Lane Brandon Durham DH7 8SJ	*Door Slammer*	6
Micromega 230-236 Lavender Hill London SW11 1LE	*Challenge*	2
Psion/Sinclair Stanhope Road Camberley Surrey GU15 3PS	*Fantasy Games*	8
Quicksilva Palmerston Park House 13 Palmerston Road Southampton SO1 1LL	*Ocean Trader* *Galaxians and Gloops*	9 7

VALH

48K SPECTRUM

ALLA

MOVI SOFT

LEGEND

VALHALLA is supplied on a 48K Spectrum program cassette, with VALHALLA player manual and presentation box. As VALHALLA uses the full 48K RAM, microdrives and full-size printers are not supported. ZX printer optional.

VALHALLA is normally available from stock, and orders are despatched by return. If, for any reason we are unable to fulfil your order within 14 days of receipt, we will notify you.

VALHALLA cassettes carry an unconditional lifetime replacement guarantee.

TO ORDER: (UK Orders Only) Simply complete the coupon, and FREEPOST with your cheque/P.O. made payable to LEGEND (UK Mail Order).
Credit Card Orders: By phone 9-5.30 Mon to Fri. stating name and address. Card No. and item(s) required.

RETAILERS: Please contact your regular distributor or LEGEND (Trade Distribution) at the address below.

LEGEND (UK Mail Order) FREEPOST
1 Milton Road, Cambridge CB4 1UY
(0223) 312453

MOVISOFT OPERATING SYSTEM UNDER LICENCE

Post to:- LEGEND (UK Mail Order) FREEPOST
1 Milton Road, Cambridge CB4 1UY
Please send me.....Copy/copies of
VALHALLA for the 48K Spectrum.
I enclose cheque/P.O. for £.....
(£14.95 each incl. VAT and P&P).
Or I wish to pay by Access/Barclaycard/Visa
Card No.....
Please print name and address
Name.....
Address.....
.....
.....
Credit Card holder's signature.....

POP-W.2

A change of key

***Trevor Toms** moves on to the keyboard in the last of the series on machine code*

Now we move on to the keyboard. If you've been following these articles religiously, you'll be well aware that I've used a ROM routine (which I call *Awaits-key*) at address 15D4h to obtain keyboard input. This routine is reasonable, but it suffers from one or two drawbacks.

First of all, it actually suspends operation of your program until a key is pressed. This is probably undesirable, since what I suspect most programs require is a sort of *Inkey$* facility whereby a zero reply is given if no key is being pressed. Secondly, it's too slow since it uses the system variables *Repper* and *Repdel* to control repeat key actions. You can alter the value of these variables, but it doesn't get away from the fact that machine coded programs are normally intended for speed.

Listing 1 shows a subroutine which simulates the *Inkey$* function exactly. On returning, register L contains the code of any key being pressed, or zero if no key. Register H as usual contains zero, allowing you to maintain a degree of consistency in your work. In practice, the direct Basic equivalent of this subroutine is *"Code Inkey$"* since it gives the code value rather than a physical string.

This routine is fast, although not as fast as direct keyboard scanning. If you want the fastest action, your best course is to use *"IN"* commands along the lines suggested in chapter 23 of the Spectrum handbook, since in most cases, programs requiring this degree of speed will be arcade-style games. As an example, if you want to detect any of the keys B to *Space* on the bottom row, you would write:

```
LD    BC,32766      ;scan bottom right B-SPACE
IN    A, (C         ;obtain key data
AND   1Fh           ;isolate keyboard data only
CP    1Fh           ;test for a key press
JP    NZ,key$press  ;jump if a key is being pressed
....                ;otherwise continue
```

If you are interested in one particular key, say the *"N"* key, you could rewrite the above routine to mask the single bit corresponding to that key. The five keys are represented by the five least significant bits of the returned data, and a zero value in any position indicates that the key is being pressed. So to detect *"N"*, you would write:

```
LD    BC,32766      ;scan B-SPACE keys
IN    A,(C)         ;obtain half-row data
AND   8h            ;isolate "N" key status, bit 3
JR    Z,NPRESSED    ;jump if key is being pressed
....
```

This method has the distinct advantage that multiple key pressing can take place and the program will be able to detect them all. Against this, the disadvantage is that you cannot easily and quickly discover the "code" value of the key without some lengthy conversion coding. The *Inkey$* routine in Listing 1 cannot detect multiple key pressing, although it will continue to recognise the latest pressed key, so you must choose the best method of detection according to your own needs.

Listing 2 gives a full *Input* simulation for you to include. It places all received data into the area addressed by the system variable *Eline*, and places a carriage return (hex 0D) character at the end of the string. If you want a prompt to appear in front of the cursor, you should send your string to stream 1 before entering the routine. On return, register pair HL contain the address of the first character of the entered data. The routine sets flags as if *Line* data is to be entered, and so if SHIFT/6 is pressed, the subroutine sets HL to zero on exit. In this way, your program can detect any "break" attempt.

In any case, this routine does not clear the bottom two lines prior to accepting data — your program must do that first (this allows you to display a prompt) by calling a ROM routine at address 0D6Eh which I'll refer to as *XCLslow*. Your complete input routine would therefore look something like:

```
XCLSLOW: EQU  0D6Eh
XCLS:    EQU  0D6Bh
SELDEV:  EQU  1601h
         LD   A, 1              ;select
                                 lower screen
         CALL SELDEV
         CALL XCLSLOW           ;clear
                                 lower screen
         LD   HL,PROMPT         ;prompt string
                                 address
         CALL PRINT$STRING      ;display prompt
                                 —see part 4
         CALL INPUT             ;see listing 2
```

At this point, HL hold the data address or zero if SHIFT/6 has been pressed (I'll ignore this for the moment). We could process it as required, but for now I will merely copy it on to the top line of the display:

```
         PUSH HL                ;save data
                                 pointer
         LD   A, 2              ;select main
                                 display
         CALL SELDEV
```

Listing 1

```
Addr Hex        Op    Operands

FA00            XKSCAN:
FA00             EQU   28EH
FA00            XKTEST:
FA00             EQU   31EH
FA00            XKDCODE:
FA00             EQU   333H
FA00            INKEY$:
FA00 CD8E02      CALL  XKSCAN
FA03 0E00        LD    C,0
FA05*2000        JR    NZ,IKB
FA07 CD1E03      CALL  XKTEST
FA0A*3000        JR    NC,IKB
FA0C 15          DEC   D
FA0D 5F          LD    E,A
FA0E CD3303      CALL  XKDCODE
FA11 4F          LD    C,A
FA12            IKB:
FA12 69          LD    L,C
FA13 2600        LD    H,0
FA15 C9          RET

Symbols:
XKSCAN 028E     XKTEST 031E
XKDCOD 0333     INKEY$ FA00
IKB    FA12
No error(s)
```

Listing 2

```
Addr Hex        Op    Operands

FA20            XCLRWK:
FA20             EQU   16B0H
FA20            XEDITOR:
FA20             EQU   0F2CH
FA20            XIRESET:
FA20             EQU   20A0H
FA20            KCUR:
FA20             EQU   23643
FA20            FLAGX:
FA20             EQU   23665
FA20            ERRSP:
FA20             EQU   23613
FA20            WORKSP:
FA20             EQU   23649
```

```
        CALL XCLS       ;clear entire
                        screen
        POP  HL         ;restore data
                        pointer
PDATA:  LD   A,(HL)     ;now print
                        the string
        RST  10h
        LD   A,(HL)     ;get the
                        character again
        INC  HL         ;step to next
                        character
        CP   0Dh        ;is it the end?
        JR   NZ,PDATA   ;repeat if not
                        the end
        ....
        ....
PROMPT: DEFB 16         ;string length
        DEFM 'Enter something:'
```

As a small exercise, you may like to alter the program given in an earlier article to use the *Inkeys* routine given this week instead of *Await$key*. The difference is very noticeable!

The last routine this week is a subroutine that converts ASCII numeric characters into a 16-bit unsigned binary value. This will help you to allow numeric data to be entered into your *Input* routine, and then to be converted for subsequent use. The subroutine is called *Asctobin* and is shown in listing 3. It expects registers HL to hold the address of the ASCII string, and on returning, HL holds the converted binary value. Conversion stops when a non-numeric character is found (numeric characters are '0'-'9', or 30h-39h).

Asctobin relies on the MUL16 subroutine given in the first article of this series. It also uses a small ROM routine at address 2D1Bh to test whether a character in register A is a valid ASCII number. Here's how to use the entire package this week:

```
LD    A,1               ;select lower screen
CALL  SELDEV
CALL  XCLSLOW           ;clear it
LD    HL,MESSAGE        ;print a prompt
CALL  PRINT$STRING
CALL  INPUT             ;obtain data
LD    A,H               ;Check if SHIFT/6 was attempted
OR    L
JP    Z,0               ;"RAND USR 0" if error
CALL  ASC$TO$BIN        ;convert data to binary
LD    (ITEM),HL         ;save the converted data value
```

This rounds up the current series; in the next series, later in the year, we'll move on to the floating point calculator and also study ways of using full arithmetic and printing of binary or floating point values. Personally, I tend to stay away from the calculator in machine code, since it's so much easier to write this type of routine in Basic (and it runs almost as quickly!), but there are still occasions when it comes in handy. ■

By Trevor Toms, author of *The Spectrum Pocket Book*, published by Phipps Associates.

Listing 3

```
FA20              CHADD:
FA20               EQU  23645
FA20              INPUT:
FA20 CDB016        CALL XCLRWK
FA23 21715C        LD   HL,FLAGX
FA26 CBEE          SET  5,(HL)
FA28 CBFE          SET  7,(HL)
FA2A CBB6          RES  6,(HL)
FA2C 010100        LD   BC,1
FA2F F7            RST  30H
FA30 360D          LD   (HL),0DH
FA32 225B5C        LD   (KCUR),HL
FA35 2A3D5C        LD   HL,(ERRSP)
FA38 E5            PUSH HL
FA39*210000        LD   HL,IN$ERROR
FA3C E5            PUSH HL
FA3D ED733D5C      LD   (ERRSP),SP
FA41 CD2C0F        CALL XEDITOR
FA44 E1            POP  HL
FA45 CDA020        CALL XIRESET
FA48 2A615C        LD   HL,(WORKSP)
FA4B              INX:
FA4B E3            EX   (SP),HL
FA4C 223D5C        LD   (ERRSP),HL
FA4F FD3600FF      LD   (IY),0FFH
FA53 E1            POP  HL
FA54 C9            RET
FA55              IN$ERROR:
FA55 CDA020        CALL XIRESET
FA58 210000        LD   HL,0
FA5B 18EE          JR   INX

Symbols:
XCLRWK 16B0    XEDITO 0F2C
XIRESE 20A0    KCUR   5C5B
FLAGX  5C71    ERRSP  5C3D
WORKSP 5C61    CHADD  5C5D
INPUT  FA20    INX    FA4B
IN$ERR FA55
No error(s)
```

```
Addr Hex          Op    Operands

FB00              MUL16:
FB00               EQU  0FF58H
FB00              XNUMBER:
FB00               EQU  2D1BH
FB00              ASC$TO$BIN:
FB00 110000        LD   DE,0
FB03*1800          JR   ASC3
FB05              ASC2:
FB05 E5            PUSH HL
FB06 D630          SUB  30H
FB08 5F            LD   E,A
FB09 1600          LD   D,0
FB0B D5            PUSH DE
FB0C 1E0A          LD   E,10
FB0E CD58FF        CALL MUL16
FB11 D1            POP  DE
FB12 19            ADD  HL,DE
FB13 EB            EX   DE,HL
FB14 E1            POP  HL
FB15              ASC3:
FB15 7E            LD   A,(HL)
FB16 23            INC  HL
FB17 CD1B2D        CALL XNUMBER
FB1A EB            EX   DE,HL
FB1B 30E8          JR   NC,ASC2
FB1D C9            RET

Symbols:
MUL16  FF58    XNUMBE 2D1B
ASC$TO FB00    ASC2   FB05
ASC3   FB15
No error(s)
```

AGF

PROGRAMMABLE JOYSTICK INTERFACE for Spectrum or ZX81

ONLY 32.95 +£1.00pp

MICRODRIVE COMPATIBLE

ABOUT OUR INTERFACE

The AGF Programmable Joystick Interface is a unique design offering the use of any Atari-compatible joystick with absolutely all software, whether it is cassette or ROM cartridge, with the Sinclair Spectrum or ZX81.

The hardware programmable interface requires no additional software and accurately replicates the keys of the computer in a manner which is responsive to absolutely *ALL* key reading methods, both BASIC and Machine Code.

The interface does not interfere with key operation and can therefore be used simultaneously with the keyboard.

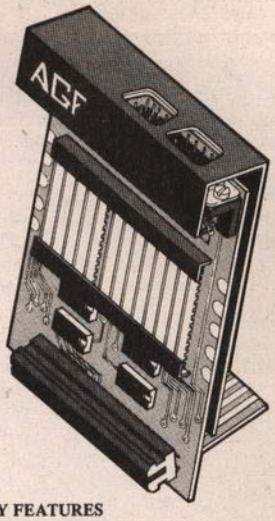
There is no need to remove the interface once fitted as the rear extension connector will accommodate further expansion, i.e printers or RAM packs etc. This important feature avoids excessive wear to the expansion port.

The key replication principle pioneered by AGF means that your own programs can use eight directional joystick movement by utilising simple key reading BASIC.

Two joystick sockets are provided which share the same keys, for use with the majority of two player games. Several interfaces may be used on the same computer for multiple joystick applications.

The interface is programmed by a two digit code, which is looked up on a programming chart supplied, for each direction and firing button. The two numbers are then selected on a pair of leads which are clipped onto appropriately numbered strips on the interface.

Once configured this can be marked on a Quick Reference Programming Card for storing with the game. As the programming is *not* power dependent the interface retains the last configuration made and can be immediately used when next switched on.



KEY FEATURES

- ★ Programmable design gives TOTAL software support.
- ★ Accepts Atari, Competition Pro, Wico, Starfighter, Quick Shot, Le Stick etc.
- ★ Rear extension connector for all other add-ons.
- ★ Free demo program and instructions.

PACKAGE CONTENTS SUPPLIED

- Programmable Interface Module as illustrated, complete with clip-on programming leads.
- Self adhesive programming chart detailing how to define which key is simulated by UP, DOWN, LEFT, RIGHT, and FIRE. This can be fixed on to the case of your computer or if preferred the protective backing can be left on. The chart is made of a very durable reverse printed plastic and is extremely easy to read.
- One pack of ten Quick Reference Programming Cards for at-a-glance setting to your games requirements. The card allows you to mark the configuration in an easy to read fashion with space to record the software title and company name.
- Video Graffiti demonstration program which is written totally in BASIC to illustrate how all eight directions and fire can be read. This is also a useful high resolution drawing program.
- 12 months guarantee and full written instructions.

JOYSTICKS

CONTROLLERS

FOR USE WITH OUR INTERFACE Module or VIC 20, Commodore 64, Atari VCS, Atari 400, Atari 800

If you require extra Joysticks for our original interface module mark order 'OLD' Joysticks

ONLY £7.54 inc VAT + P&P

FROM: MR/MRS/MISS

ADDRESS

SEND C.W.O. (NO STAMP NEEDED) TO: A.G.F. HARDWARE, DEPT. **PW,**

FREEPOST, BOGNOR REGIS, WEST SUSSEX, PO22 9BR

QTY	ITEM	ITEM PRICE	TOTAL
	PROGRAMMABLE INTERFACE	33.95	
	JOYSTICK(S)	7.54	
	PACK(S) QUICK REFERENCE CARDS	1.00	
ONE	VIDEO GRAFFITI	FREE	
	ZX81 ☐ ZX SPECTRUM ☐ Please tick	FINAL TOTAL	

DEALER ENQUIRIES WELCOME *EXPORT PRICES ON APPLICATION*

Force and motion

***Roy Masefield** presents a program based on Isaac Newton's Laws of Motion*

The name of Sir Isaac Newton conjures up in everyone's mind the one word — "gravity". But gravity is only one part of the vast field opened up by his pioneering work. This work, culminating in the formulation of his Laws of Motion, now permeates the whole of classical physics and mechanics, and, of course, was the basis on which Einstein and others built their theories, modifying the work of Newton.

Until Newton's time (1642-1727) ideas of force and motion were vague, to say the least, although astronomers had already amassed a great deal of data on how the heavenly bodies moved. It was generally believed, for instance, that a body could be kept in motion only if a force were continually applied.

Newton, in a series of simple experiments and beautiful logic, showed that, once set in motion by a force, the body would proceed in a straight line when the force was removed, and could go on for ever. It could only be deviated from the straight line or made to change its velocity by the application of another force. This is the essence of his first Law of Motion.

Newton did what others had failed to do: he made precise definitions of Force, Mass, Velocity, Time, Distance and Acceleration, and he derived a set of simple equations relating these quantities. His second law relates force with mass and acceleration, and the third stresses that action and reaction are equal and opposite. From these equations it is possible to deduce the behaviour of moving bodies, given certain initial data.

For our present purposes we will leave out force and mass, and assume that acceleration is produced by some unspecified force. So we have five quantities to consider: Initial Velocity (u); Final Velocity (v); Distance (s); Time (t) and Acceleration (a). There are three fundamental equations which relate these quantities:

$s = ut + \frac{1}{2}at^2$ ....(1)
$v^2 = u^2 + 2as$ ....(2)
$v = u + at$ ....(3)

Given any three of these quantities, it is possible to juggle with the equations to derive the other two (except when the three given are final velocity, distance and time, because it is then impossible to find initial velocity unless we know the acceleration).

There are 12 possible combinations and so in any particular problem, it is a matter of choosing the right one. For some combinations two equations have to be used in sequence. The accompanying program was developed to automate the selection and do the donkey-work.

When RUN, you are asked to input values for u, v, s, t and a, entering a ? for the unknown quantities which are to be found. The program will then select the equations and print the answers along with the data. If the forbidden combination (v, s and t) is entered, the printout will inform you so.

Some of the equations involve taking a square root, and sometimes the data will lead to a negative value to be rooted; this is impossible for the computer, so in these cases you will again be told. In one combination (s, u and a input) there will be two times printed, generally one positive and one negative. This is because a quadratic equation has to be solved, and, as you know, there are always two roots to a quadratic.

Negative times can be ignored, but two positive times means both are legitimate answers. If the roots of the quadratic are imaginary (not real) then you will be told so. Remember, too, negative accelerations can be entered — they are simply decelerations. If negative velocities and distances are output, they imply motion in the opposite direction. ■

```
    5 REM NEWTON'S LAWS OF MOTION
    6 REM @ W.R.Masefield 1983
   10 CLEAR : CLS : PRINT  TAB 5;"NEWTON'S LAWS OF MOTION": PRINT : PRINT "Five q
uantities are involved:   Initial Velocity (u); Final     Velocity (v); Distance
 (s);      Time (t); Acceleration (a)."
   20 PRINT "      Given three of these, the others may be found (except     for
the combination of Final     Velocity, Distance and Time).   Enter values (all in
 the same   system of units) as prompted    below. Enter a ? for the un-     know
ns."
   30 INPUT "Initial Velocity?";u$,"Final Velocity?  ";v$,"Distance?         ";s$,
"Time?";t$,"Acceleration?";a$
   40 CLS : PRINT  TAB 5;"NEWTON'S LAWS OF MOTION": PRINT : PRINT "Data:": PRINT
 TAB 3;"Initial Velocity: ";u$
   50 PRINT  TAB 5;"Final Velocity: ";v$: PRINT  TAB 11;"Distance: ";s$
   60 PRINT  TAB 15;"Time: ";t$: PRINT  TAB 7;"Acceleration: ";a$: PRINT : PRINT
"Results:"
   70 IF u$ <> "?" THEN  LET u= VAL u$
   71 IF v$ <> "?" THEN  LET v= VAL v$
   72 IF s$ <> "?" THEN  LET s= VAL s$
   73 IF t$ <> "?" THEN  LET t= VAL t$
   74 IF a$ <> "?" THEN  LET a= VAL a$
   80 IF t$="?" AND a$="?" THEN  GO TO 180
   90 IF v$="?" AND a$="?" THEN  GO TO 200
  100 IF v$="?" AND t$="?" THEN  GO TO 220
  110 IF u$="?" AND a$="?" THEN  GO TO 260
  120 IF u$="?" AND t$="?" THEN  GO TO 270
  130 IF u$="?" AND v$="?" THEN  GO TO 300
  140 IF s$="?" AND a$="?" THEN  GO TO 320
  150 IF s$="?" AND t$="?" THEN  GO TO 340
  160 IF s$="?" AND v$="?" THEN  GO TO 360
  170 IF s$="?" AND u$="?" THEN  GO TO 380
  180 GO SUB 510: GO SUB 750
  190 GO SUB 630: GO SUB 740: GO TO 400
  200 GO SUB 520: GO SUB 750
  210 GO SUB 600: GO SUB 720: GO TO 400
  220 IF u*u+2*a*s<0 THEN  PRINT "Final Velocity cannot be found  as a negative s
quare root is     called for": GO TO 235
  230 GO SUB 530: GO SUB 720
  235 IF 4*u*u+8*s*a<0 THEN  PRINT "There are no real roots of the  time quadrati
c, so time cannot  be found.": GO TO 400
  240 GO SUB 540: GO SUB 740
  250 GO SUB 550: PRINT  TAB 17;"or ";t: GO TO 400
```

Continued on page 23

THE DAN DIAMOND TRILOGY

My name is Diamond, Dan Diamond,
and this is my story. A story of beautiful mermaids, bored robots and dank, dark dungeons. A story that started one muggy day in New York, and like the Big Apple, it's rotten to the core.

The Dan Diamond Trilogy is three separate adventure games. Each game may be played on its own, but clues may be found in the earlier adventures which may help later on. Each game comes with a lavishly illustrated 20-page case file, and hints (both helpful and misleading) which have been hidden in the illustrations.

Part I. Franklin's Tomb, in which our hero receives a mysterious plea for help which leads him to a hidden tomb and the mystery of the stargate.

Part II. Lost in Space, in which our hero finds himself stranded on a derelict spacecraft, doomed to travel endlessly through space, or find a way out.

Part III. Fishy Business, in which our hero lands on a watery planet, discovers the source of the plea for help and saves the day.

"It must be the most consistently enjoyable adventure game I've ever played"
– Computer Choice (Program of the Month) –

All three programs cost £9.95 each and are available for the DRAGON 32, BBC MODEL B and 48k ORIC-1 microcomputers. (note: Fishy Business for the BBC and ORIC will be available February 1984).

Cheques or postal orders payable to:

Salamander SOFTWARE

17 Norfolk Road, Brighton, East Sussex, BN1 3AA.

Look out for Dan Diamond's next Adventure Series "Franklin in Wonderland" Available Spring 1984

```
 260 PRINT "    Data does not allow Initial Velocity or Acceleration to be  calc
ulated": GO TO 400
 270 IF v*v-2*a*s<0 THEN  PRINT "Initial Velocity cannot be foundas a negative s
quare root is    called for. Hence Time also     cannot be found.": GO TO 400
 280 GO SUB 560: GO SUB 710
 290 GO SUB 630: GO SUB 740: GO TO 400
 300 GO SUB 570: GO SUB 710
 310 GO SUB 600: GO SUB 720: GO TO 400
 320 GO SUB 580: GO SUB 750
 330 GO SUB 590: GO SUB 730: GO TO 400
 340 GO SUB 620: GO SUB 730
 350 GO SUB 630: GO SUB 740: GO TO 400
 360 GO SUB 590: GO SUB 730
 370 GO SUB 600: GO SUB 720: GO TO 400
 380 GO SUB 610: GO SUB 710
 390 GO SUB 590: GO SUB 730
 400 PRINT  AT 21,0;"Press n for new run, s to stop"
 410 IF  INKEY$ ="" THEN  GO TO 410
 420 IF  INKEY$ ="n" THEN  GO TO 10
 430 STOP
 500 REM Formulae SBR's
 510 LET a=(v*v-u*u)/2/s: RETURN
 520 LET a=2*(s-u*t)/t/t: RETURN
 530 LET v= SQR (u*u+2*a*s): RETURN
 540 LET t=(-2*u+ SQR (4*u*u+8*a*s))/2/a: RETURN
 550 LET t=(-2*u- SQR (4*u*u+8*a*s))/2/a: RETURN
 560 LET u= SQR (v*v-2*a*s): RETURN
 570 LET u=(s-.5*a*t*t)/t: RETURN
 580 LET a=(v-u)/t: RETURN
 590 LET s=u*t+.5*a*t*t: RETURN
 600 LET v=u+a*t: RETURN
 610 LET u=v-a*t: RETURN
 620 LET s=(v*v-u*u)/2/a: RETURN
 630 LET t=(v-u)/a: RETURN
 700 REM Print Results SBR's
 710 PRINT  TAB 3;"Initial Velocity=";u: RETURN
 720 PRINT  TAB 5;"Final Velocity=";v: RETURN
 730 PRINT  TAB 11;"Distance=";s: RETURN
 740 PRINT  TAB 15;"Time=";t: RETURN
 750 PRINT  TAB 7;"Acceleration=";a: RETURN
```


New from SUNSHINE

Master your ZX Microdrive

programs, machine code and networking by Andrew Pennell

Master your ZX Microdrive contains all the information you will ever need to use the ZX Microdrive to the full. Clearly explained, with many examples, it is equally suitable for the relative newcomer to BASIC through to the experienced machine code programmer.

ISBN 0 946408 19 X

Andrew Pennell has also included a full database file handling program to let you put the ZX Microdrive to practical use with your Sinclair Spectrum.

Look out for the Sunshine range in W.H. Smith's, Boots, John Menzies, other leading retail chains and through our national network of book shops and specialist stores. Dealer Enquiries: 01-437 4343

Please send me

☐ Master your ZX Microdrive at £6.95 each

I enclose cheque/postal order for £_____ made payable to: Sunshine Books: 12/13 Little Newport St., London WC2 3LD.

Or 'phone your order through on Access Mastercard 01-437 4343

Name _____

Address _____

_____

Signature _____

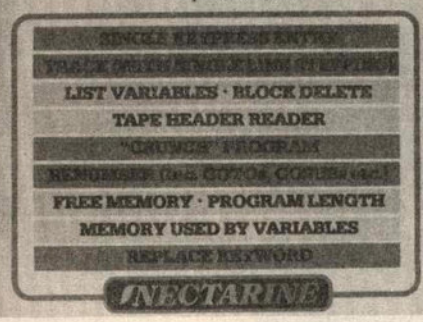
We can normally deliver in 4/5 days.

For 16/48K SPECTRUM

SUPER TOOLKIT

FOR SPECTRUM BASIC PROGRAMMERS

Written by Adrian Jones



From all good stockists or direct from

NECTARINE

837 Yeovil Road, Slough SL1 4JH

Send **£10.70** incl p&p

Paint it black

J Smith presents a simple program for drawing and printing hi-res graphics

This is a very simple and relatively short program, occupying just over 2K of memory. It allows the drawing of either black and white graphics in the Dragon's highest resolution, or full colour in medium resolution with the added capability of painting in different areas of the screen. In addition, both the monochrome and colour screens can be transferred to permanent copy using the four colours of the Tandy CGP 115 printer.

In fact, though the program is short and simple, it appears to offer similar capabilities to the commercial programs now appearing on the market. The program listing and notes which follow explain how it works, so I shall only add a brief description of the use of the right joystick for drawing and the keyboard for selecting the other facilities.

Joystick functions — on running the program you are asked to select monochrome or colour drawing. Having done so, you are given a clean "sheet" of white screen to draw on, with the cursor flashing at the top right corner. The drawing colour is automatically set to white at start up, so the joystick can move the cursor about without leaving a trail.

To start drawing, use key *6* for black and *5* to return to white (which can therefore be used to draw over and "rub-out" any incorrect lines). In full colour, use key *6* for cyan (printed as green), *7* for magenta (blue) and *8* for orange (red), again returning to *5* for white (to move without drawing or to rub-out).

Keyboard functions — to fill in a shape with colour (or black), first make sure that the shape is complete with no gaps (or else the "paint" will leak out and cover the whole screen). Next, move the cursor so that it is inside the shape. Then, press the *F* key and the joystick button.

To clear the whole screen to white, just press *C* at any stage of drawing. If you decide you want to change from black and white to full colour or vice-versa, then press *B* which returns you to the colour selection screen.

To use the tape recorder, press *S*. This will give you a prompt to start the tape running by setting the recorder to *Play*. When you have found the bit of tape you want (which will be either a clean part, for saving a picture on, or the start of a file containing a picture that you wish to load) press the *Enter* key and the tape recorder will stop.

You will then receive a prompt to put the tape recorder at the appropriate setting for saving or loading, with a further request to press *Enter*. The final prompt is to input *1* or *2* to save or load respectively. These two functions are then carried out automatically, after which you are returned to the drawing screen again.

The last keyboard function is to press *P*, which will automatically set the printer to reproduce the drawing on the screen. By turning the picture on its side (see notes for line 630) the full width of the paper is used for the shorter vertical side of the screen, while the longer, horizontal side of the screen, is printed down the length of the paper. If you are only printing a drawing or a small section of the screen, you can stop the printer and return to the main drawing program at any time by pressing *R*.

Apart from using this program freehand, as it were, it is also possible to extract the printing subroutine at lines 600 to 770 and incorporate it into any other basic program with the *Gosub* lines inserted at the appropriate point; ie, in your own main program insert lines 220 and 430 to lead the program to the screen printing subroutine when key *P* is pressed.

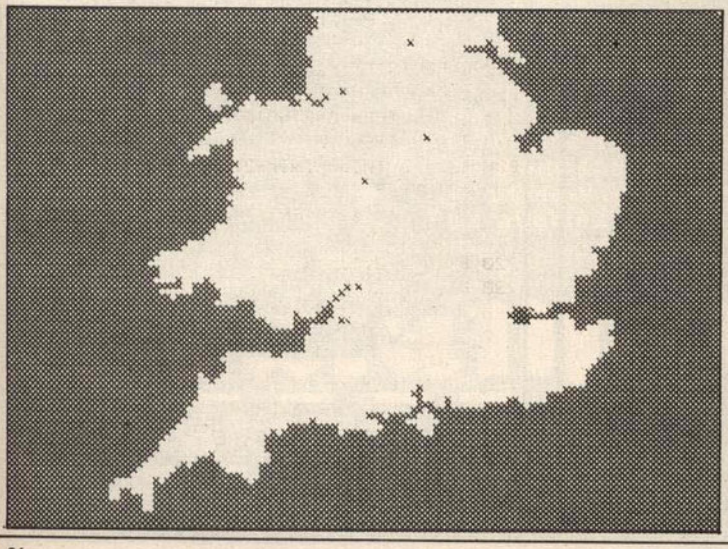
One other way of printing a hi-res screen from any Basic program which is already running is to use the following sequence: *Break* the program at the scene you wish to print. This, of course, returns you to the text screen (although the hi-res screen is not on view, it is still in memory and can be brought back using *Screen 1, 1*). Next, load my program from tape. Then, *Edit* line 100, remove the *PCLS5* (so that the hi-res picture is not erased) and type in direct mode (ie, do not use a line number) *Goto 70*. Do not use Run or memory is wiped clean.

You will then be asked to select the appropriate colour mode. After inputting *1* or *2*, you will have the scene from the previous program displayed. As you are now in the main program loop, press *P* and the printer will be set into action.

Acknowledgement — as will be obvious to anyone who has a copy of the excellent book *The Working Dragon 32*, lines 260 and 270 and the general structure of the tape save/load subroutine are based on ideas by David Lawrence.

Numeric Variables

M =	Set monochrome or colour.
N =	Set Pmode.
R =	Size of printed pixel.
Q =	Magnification factor to fill the printer paper width.
X & Y =	Location of drawing cursor on screen.
Z =	Colour selected for drawing.
C =	Colour for printer to use.
S =	Flag to allow printer to jump pixels which are not set on the screen (ie white)
PE =	Peek to see if joystick button is pressed.
J(I) =	Joystick allocation.



String Variables

A$ = Reads key pressed for colour selection and subroutines.

E$ & I$ = Blank variables to allow tape recorder to be switched on and off.

Notes

70-100 Sets up the screen for drawing either in Pmode 4 (hi-resolution black on white) or Pmode 1 (medium resolution in colour — cyan, magenta, orange on white).

110 Draws cursor top right.

200-310 Main program loop.

210 Read joystick.

220 Read keyboard.

230 If no key pressed then colour selection (set by Z) remains the same.

240 If alphabetic key pressed go to subroutine 400

250 Store value of numeric key pressed in Z to maintain colour chosen.

260-270 Moving right joystick moves cursor.

280-290 Make cursor flash on and off so it is not lost against background.

310 Return to start of main program.

Subroutine 400-460

REM statements are self-explanatory.

Subroutine 500-590

510 Use enter key to switch on tape recorder.

520 Switch off tape and prompt to put tape recorder in record or play mode.

530 Select saving or loading a picture on tape.

550 Save picture as machine code file.

580 Load picture from tape.

Subroutine 600-770 Print out picture on TANDY CGP 115.

610 Select graphics mode.

620 Start pen at top left on paper.

630 & 760 Loop to read pixels on screen in reverse (to avoid mirror image on printer).

640 Pressing "R" while printer is running will return to main program.

650 Read colour of pixel on screen.

660 If colour is white jump drawing routine to leave paper blank.

670 If pixel colour is cyan set pen colour to green.

680 If pixel colour is magenta set pen colour to blue.

690 If pixel colour is black (in Pmode 4) set pen to black.

If none of the above colours is set then the red pen corresponds to orange pixels.

700 Get printer to select appropriate coloured pen.

710 If program has been scanning white pixels then pen has to be moved, without drawing, to the next point for a colour plot to be printed.

Note reversal of X and Y from the screen to Y and X co-ordinates on the printer to turn the picture on its side. This together with the magnification of Q makes maximum use of the smaller width of this printer's paper.

720-740 Draws an X at the selected location.

750 As each vertical line of screen is completed the pen must lift off the paper and return to the next line of pixels.

770 Return pen to left side of paper when the picture is completed.

Subroutine 800-820.

If joystick button is pressed the area is painted in, starting at the cursor, and using the same colour as the cursor, extending until it reaches a surrounding line of similar colour (hence the need to ensure the area to be painted is completely enclosed). ■

```
10 '          **********************
20 '          *      D.A.P.        *
30 '          * DRAW  AND  PRINT   *
40 '          *   J.A.Smith        *
50 '          *    10/12/83        *
60 '          **********************
70 CLS:PRINT:PRINT:PRINT"ENTER COLOUR SE
LECTION.",,,,"1.BLACK ON WHITE","2.FULL
COLOUR":PRINT:PRINT:INPUT"ENTER 1 OR 2";M
80 N=1:R=5:Q=2.5
90 IFM=1 THEN N=4:R=2:Q=2
100 PMODEN,1:PCLS5:SCREEN1,1
110 X=255:Y=0
200 'Main Program Loop.
210 FORI=0 TO3:J(I)=JOYSTK(I):NEXT
220 A$=INKEY$
230 IFA$=""THENA$=STR$(Z)
240 IFASC(A$)>60 THEN400
250 Z=VAL(A$):IFZ<5 ORZ>8 THEN Z=5
260 X=X-M*(J(0)>50)+M*(J(0)<14):X=X+M*(X
>255)-M*(X<0)
270 Y=Y-M*(J(1)>50)+M*(J(1)<14):Y=Y+M*(Y
>191)-M*(Y<0)
280 IFZ=5 THEN PSET(X,Y,Z):PSET(X,Y,6):F
ORD=1 TO100:NEXT:PSET(X,Y,Z)
290 PSET(X,Y,Z):PSET(X,Y,5):FORD=1 TO100
:NEXT:PSET(X,Y,Z)
300 FORD=1 TO100:NEXT
310 GOTO200
400 'Keyboard Input.
410 IFA$="C"THENPCLS5 '          Press
C to clear screen.
420 IFA$="F"THENGOSUB800 '       Press
F to fill area with colour.
430 IFA$="P"THENGOSUB600 '       Press
P to transfer picture to printer.
440 IFA$="S"THENGOSUB500 '       Press
S to save or load on tape.
450 IFA$="B"THEN70 '             Press
B to change colour selection.
460 GOTO200
500 'Save or Load Picture on Tape.
510 MOTORON:AUDIOON:CLS:INPUT"PRESS play
 TO POSITION TAPE THENPRESS enter TO STO
P.";E$
520 MOTOROFF:AUDIOOFF:PRINT:PRINT:INPUT"
PUT RECORDER AT record TO SAVE  OR play
TO LOAD A SCREEN. THEN  PRESS enter";I$
530 PRINT:PRINT:PRINT"WHICH DO YOU WISH
TO DO ?","1....SAVE SCREEN.","2....LOAD
SCREEN.":INPUT"enter  1 OR 2";I:ONI GOTO
550,580
540 SCREEN1,1:RETURN
550 MOTORON:FORD=1 TO3000:NEXT:CSAVEM"SC
REEN",1536,7679,6144
560 SCREEN1,1
570 RETURN
580 PCLS:CLOADM"SCREEN",0
590 SCREEN1,1:RETURN
600 'Dump Screen to Printer.
610 PRINT#-2,CHR$(18)
620 PRINT#-2,"I"
630 FORX=255 TO 0 STEP-M:FORY=0 TO191STE
P M
640 A$=INKEY$:IFA$="R"THEN PRINT#-2,"A":
RETURN '    Press R to stop printer and
return.
650 C=PPOINT(X,Y):C=C-5
660 IFC=0 THENS=1:GOTO760
670 IFC=1 THEN C=2:GOTO700
680 IFC=2 THEN C=1
690 IFC=-5 THENPRINT#-2,"C0":GOTO710
700 PRINT#-2,"C";C
710 IFS=1 THENS=0:PRINT#-2,"M";Y*Q",";-(
(255-X)*Q)
720 PRINT#-2,"J";R",";-R
730 PRINT#-2,"R";-R",0"
740 PRINT#-2,"J";R",";R
750 IFY=192-M THENPRINT#-2,"M0,";-((255-
(X-M))*Q)
760 NEXTY:NEXTX
770 PRINT#-2,"A":RETURN
800 'Fill Area with Colour.
810 PSET(X,Y,Z-1):PE=PEEK(65280):IFPE=25
4ORPE=126THENPAINT(X,Y),Z,Z ELSE 810
820 RETURN
```

TURN YOUR PROGRAMME UPSIDE DOWN

Now you can add another dimension to your games. Swap direction, swap functions, confuse your friends. In fact you can add almost any twist to your games with Stonechip's Programmable Joystick Interface.

You can also listen to them with Stonechip's Echo Amplifier.

Programmable Joystick Interface. This also enables any Spectrum software to be used with a joystick, irrespective of which keyboard keys have been chosen for function.

Programming is easy using only a single switch. Switch one way to program and another way to play. No tapes to load or links to worry about — all programming is achieved by hardware. Used with Atari-compatible joysticks. Simply plugs into rear expansion port of ZX-Spectrum. No other connections to make, no additional power supply required.

Echo Amplifier. How would you like to listen to the sound output from your ZX-Spectrum without ear strain? The Stonechip Echo amplifier can do this for you as well as easing the tedium of saving or loading of tapes and enlarging the range of tape recorder compatibility with the computer. The amplifier has volume control over a range adequate for most uses, and a tone control for harsh or mellow sounds. A switched interface removes the need to swap leads during 'SAVE'ing or 'LOAD'ing. Leads are left connected all the time and the desired function is selected on the three position switch by the user. Use of the 'CUE' facility enables an audio cue to precede the program being 'SAVE'd on tape, a decided advantage when searching through a multi-program tape. The Echo simply plugs into the Ear, Mic and Power sockets of the computer and does not require an additional power supply. The expansion port at the rear of the computer is left free for use with other peripherals and the unit is housed in an attractive case custom designed to complement the ZX-Spectrum.

To: Stonechip Electronics, Unit 9, The Brook Industrial Estate, Deadbrook Lane, Aldershot, Hants.
Telephone: (0252) 318260.

Please forward me the following products:

All prices are inclusive of VAT, Post & Packing for U.K. deliveries (overseas add 15%)

Name .....

Address .....

DEALER ENQUIRIES WELCOME
Delivery approx. 14 days

STONECHIP ELECTRONICS

Stonechip Ltd. Brook Trading Estate Deadbrook Lane Aldershot Hants. GU12 4XB. Tel: (0252) 318260

Graphic power

***D Cartwright** presents a demonstration program of five graphic subroutines*

This is a demonstration program which shows the speed and power of BBC graphics. Several options are available to the user:

A	draw an elipse
B	draw a triangle
C	draw a square
D	draw a pentagon
E	draw a gcol pattern

Although written on a 1.2 OS model, the program runs on a BBC model A or B. It can easily be adapted for 1.0 models by changing the VDU 23;8202;0;0;0; which turns off the cursor.

Notes

180	inputs access code
190	if access code entered is 374375 then proceed to menu
200-410	eliptical subroutine
420-620	triangular subroutine
630-840	square subroutine
850-1130	pentagon subroutine
1140-1300	gcol pattern subroutine
1310-1520	menu

```
  1 REM****BEEB GRAPHICS****
  2 REM****     BY         ****
  3 REM****D.CARTWRIGHT  ****
  4 REM**** COPYRIGHT    ****
  5 REM**** JULY 1983    ****
 10 MODE2
 20 VDU 23;8202;0;0;0;
 30 COLOUR132:CLS
 40 COLOUR5
 50 PRINT TAB(7,14)"HELLO"
 60 PRINT TAB(5,16)"I'm a Beeb"
 70 COLOUR 0
 80 PRINT TAB(3,20)"Listen to this"
 90 FOR S=0 TO 240
100 SOUND1,-15,S,1
110 NEXT S
120 FOR T=240 TO 0 STEP -1
130 SOUND1,-15,T,1
140 NEXT T
150 COLOUR 1
160 PRINT TAB(2,25)"Enter six digit"
170 PRINT TAB(2,26)" access code"
180 INPUT A$
190 IF A$="374375" GOTO 1310 ELSE 160
200 MODE1
210 VDU 23;8202;0;0;0;
220 COLOUR129:CLS:COLOUR2
230 VDU 29,640;512;
240 PRINT TAB(1,1)"Coordinates of
    Elipse (width,hight)"
250 INPUT B,C
260 MOVE COS1*(B/2),SIN1*(C/2)
270 FOR P=1 TO 139 STEP 6
280 DRAW COSP*(B/2),SINP*(C/2)
290 SOUND 1,-15,255,0.25
300 NEXT
310 LET G=0
320 REPEAT
330 LETG=G+1
340 UNTIL G>1000
350 MODE2
360 VDU 23;8202;0;0;0;
370 COLOUR129:CLS:COLOUR4
380 PRINT TAB(2,10)"Another go (Y-N)"
390 INPUT F$
400 IF F$="Y" THEN GOTO 200
410 IF F$="N" THEN GOTO 1310 ELSE
    GOTO 380
420 MODE1
430 VDU 23;8202;0;0;0;
440 COLOUR 129:CLS:COLOUR 2
450 PRINT TAB(1,1)"Coordinates for
    triangle (3 points)"
460 INPUT F,G
470 INPUT H,J
480 INPUT K,L
490 MOVE F,G
500 DRAW H,J
510 PLOT 85,K,L
520  LET G=0
530 REPEAT
540 LETG=G+1
550 UNTIL G>1000
560 MODE2
570 VDU 23;8202;0;0;0;
580 COLOUR129:CLS:COLOUR4
590 PRINT TAB(2,10)"Another go (Y-N)"
600 INPUT F$
610 IF F$="Y" THEN GOTO 420
620 IF F$="N" THEN GOTO 1310 ELSE
    GOTO 600
630 MODE1
640 VDU 23;8202;0;0;0;
650 COLOUR 129:CLS:COLOUR 2
660 PRINT TAB(1,1)"Lenght of a side
    of the square"
670 INPUT A
680 B=A/2
690 MOVE 600-B,500-B
700 DRAW 600+B,500-B
710 DRAW 600+B,500+B
720 DRAW 600-B,500+B
730 DRAW 600-B,500-B
740 LET G=0
750 REPEAT
760 LET G=G+1
770 UNTIL G>1000
780 MODE2
790 VDU 23;8202;0;0;0;
800 COLOUR129:CLS:COLOUR4
810 PRINT TAB(2,10)"Another go (Y-N)"
820 INPUT F$
830 IF F$="Y" THEN GOTO 630
840 IF F$="N" THEN GOTO 1310 ELSE
    GOTO 820
850 MODE1
860 VDU 23;8202;0;0;0;
870 COLOUR 129:CLS:COLOUR 2
880 PRINT TAB(1,1)"Lenght of a side
    of a pentagon"
890 INPUT K
900 MOVE 100,50:DRAW 1140,50
910 J=K/2
920 MOVE 600-J,100
930 DRAW 600+J,100
940 A=SIN(72)*K
950 B=COS(73)*K
```

```
960 DRAW 600+J+A,100-B
970 MOVE 600-J,100
980 DRAW 600-J-A,100-B
990 C=SIN(57.2)*K
1000 DRAW 600,100-B+C
1010 MOVE 600+J+A,100-B
1020 DRAW 600,100-B+C
1030 LET G=0
1040 REPEAT
1050 LET G=G+1
1060 UNTIL G>1000
1070 MODE2
1080 VDU 23;8202;0;0;0;
1090 COLOUR 129:CLS:COLOUR 4
1100 PRINT TAB(2,10)"Another go (Y-N)"
1110 INPUT F$
1120 IF F$="Y" THEN GOTO 850
1130 IF F$="N" THEN GOTO 1310 ELSE
     GOTO1110
1140 MODE4
1150 VDU 23;8202;0;0;0;
1160 VDU 29,640;512;
1170 FOR A=0 TO 8
1180 GCOL A,1
1190 FOR B=1 TO 512 STEP 6
1200 MOVE 512-B,512-B
1210 DRAW B,-B
1220 DRAW -(512-B),-(512-B)
1230 DRAW -B,B
1240 DRAW 512-B,512-B
1250 NEXT
1260 NEXT
1270 LET G=0
1280 REPEAT
1290 LET G=G+1
1300 UNTIL G>1000
1310 MODE1
1320 VDU 23;8202;0;0;0;
1330 COLOUR 129:CLS:COLOUR2
1340 PRINT TAB(15,2)"Menu"
1350 PRINT TAB(2,8)"When ever you
     wish to return to the "
1360 PRINT TAB(2,9)"Menu simply press
     key N at the end"
1370 PRINT TAB(2,13)"What do you
     wish to do"
1380 PRINT TAB(4,16)"A= Elipses"
1390 PRINT TAB(4,17)"B= Triangles"
1400 PRINT TAB(4,18)"C= Squares"
1410 PRINT TAB(4,19)"D= Pentagons"
1420 PRINT TAB(4,20)"E= Graphics"
1430 PRINT TAB(4,21)"F= Stop program"
1440 INPUT R$
1450 IF R$="A" GOTO 200
1460 IF R$="B" GOTO 420
1470 IF R$="C" GOTO 630
1480 IF R$="D" GOTO 850
1490 IF R$="E" GOTO 1140
1500 IF R$="F" GOTO 1520
1510 GOTO 1440
1520 MODE7:END
```


PROGRAMMING AIDS AND LANGUAGES FROM . . . Audiogenic LTD

FOR COMMODORE VIC-20 AND 64!

VP052 BUTI PLUS - £39.95 - Basic Programming Aid Commands PLUS Machine Code Monitor PLUS 3K Expansion! Basic aids include - APPEND, AUTO, DELETE, DUMP, EDIT, FIND, HELP, RENUMBER, REPEAT, STEP, TRACE, UNNEW, VIC, and DEC to HEX. Monitor Commands - ASSEMBLE, DISASSEMBLE, CENTRONICS, FILL, GO, MEMORY, HUNT, REGISTER, PRINTED DISASSEMBLE, LOAD, QUICK EXECUTE, WALK CODE, SAVE, TRANSFER, EXIT.

VP074 MONITOR VIC - £19.95 - Monitor on its own. Commands as above.

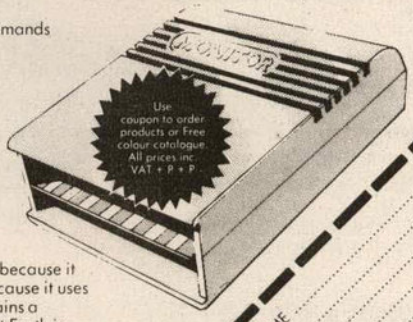
SS074 MONITOR 64 - £29.95 - 64 version. Commands as above.

VP078 MIKRO ASSEMBLER - £48.95 - Cartridge Assembler program for the VIC - Includes 3K extra memory. Write your machine language source code on Basic Lines which can be manipulated using the included toolkit commands. MIKRO uses standard MOS mnemonics, and features ASSEMBLER and DISASSEMBLER, plus TIM monitor commands, and special hi-res, sound, and joystick extensions.

SS076 FORTH 64 - £29.95 - Audiogenic Forth is very fast because it compiles right down to machine code, and very compact because it uses special screen compression routines. Audiogenic Forth contains a dictionary of over 200 Forth words, but the great thing about Forth is that you can define your own commands! Audiogenic Forth gives you full error messages (instead of codes), a full scrolling screen editor, and a comprehensive manual.

VP076 FORTH VIC - £24.95 - As above, but includes special VIC colour and sound commands. This version must be used in a motherboard with 8K+ expansion.

VP076/M FORTH VIC (with memory) - £39.95 - As VP076, but includes 3K expansion built-in so that you don't need a motherboard and expansion.



(PRODUCT & CODE NO.)

PLEASE SEND ME .....

NAME .....

ADDRESS .....

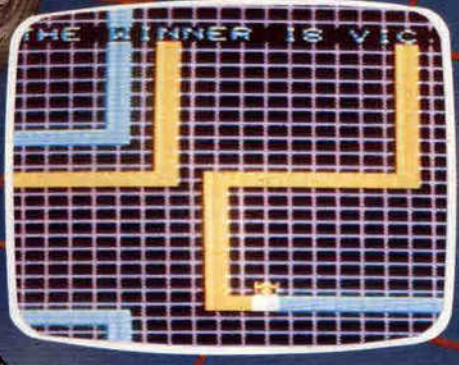
AUDIOGENIC LTD., P.O. BOX 88, READING, BERKS.

VIC 20 OWNERS *UNEXPANDED*

TURBO GRID

CAN YOU HANDLE THE CHALLENGE?

Ride in a race of nerve and daring, push your turbo bike to its limits against your most cunning opponent – the computer. Beat its champion by leaving lethal tracks in your wake...speeding deftly around the screen leaves room for only one victor – don't let it be VIC!



MICRODEAL

41 Truro Road, St. Austell, Cornwall PL25 5JE. Tel: 0726 3456

On cassette £5.50 each

Selected titles available from larger branches of Boots, John Menzies, Spectrum, Computers for All and all good computer shops.

H·U·R·G
HIGH LEVEL USER FRIENDLY
REAL TIME GAMES DESIGNER
ALL YOU NEED
IS IMAGINATION

NOW...

THE GAMES YOU IMAGINE CAN BE THE GAMES YOU PLAY

DESIGN YOUR OWN COMPUTER GAMES IN MINUTES

Introducing the incredible H.U.R.G. — The ultimate game program for people who want to really play games. With H.U.R.G. the hardest thing you will have to do is to think of a game title, and design the characters.

HIGH LEVEL — requires no programming skills — simply design the shapes you want, and H.U.R.G. will animate them into the most amazing on-screen action you've ever seen. Choose any setting for your game, from mazes to outer space or sinister caverns — the only limit is your imagination.

USER FRIENDLY — H.U.R.G. will lead you through a series of easy to follow procedures, ending in the creation of a game that is as wild as your imagination!

REAL TIME — You can see exactly what you're creating at all times. Every game has hundreds of variations, and you can change its features at any time. You can speed up the action, change the size of the characters and even make them more vicious — it's all up to you; and you can see it all on-screen immediately.

GAMES DESIGNER — H.U.R.G. enables you to design and store the games you create on cassette and play them later using H.U.R.G. as the control program. It's the one program you will never tire of.

Now you can create all the stunning arcade effects on your Spectrum that up until now have only been available to professional software houses.

BONUS

To really fire your imagination, H.U.R.G. includes three ready-to-play fast-action arcade games, created using H.U.R.G.

Design a Game...

WIN £3,000

Each month up until April 30 1984, three prizes will be awarded every month for the best games of the month

At the end, the best game will win a grand prize of £3,000

YOU could be a famous games designer! Every entrant has the opportunity of being published by Melbourne House and earning royalties.

Details of the competition are available with H.U.R.G.

Orders to:
Melbourne House
131 Trafalgar Rd
Greenwich
London SE10

Correspondence to:
Church Yard
Tring, Hertfordshire HP23 5LU

Trade enquiries welcome

☐ Please send me your free 48 page catalogue

48K SPECTRUM Cassettes

☐ H.U.R.G.	£14.9
☐ The Hobbit	£14.9
☐ Penetrator	£6.9
☐ Terror-Daktil 4D	£6.9
☐ Melbourne Draw	£8.9
☐ Computer Bridge	£8.9
☐ Abersoft Forth	£14.9
	£
	£ 8
TOTAL	£

I enclose my ☐ cheque
☐ money order for £

Please debit my Access card No.

Expiry Date Signature

Name

Address

Postcode

H.U.R.G. will be officially released in mid-December 1983. Get your order in now, and reserve your copy so that you can be among the first with this revolutionary software!
Access orders can be telephoned through on our 24-hour ansafone (01) 858 7397.

POP 2/1

Melbourne House

More

fun & games from your Spectrum with the intelligent interface+program+joystick and for only **£34.90**

Interface: * for Spectrum * 1k on board memory * own rear edge connector – for printers etc * compatible with ALL standard joysticks **Joystick:** * self centring * 8 directional microswitched action * 2 independent fire buttons **Tape:** * easy to use program, the interface WORKS ON ALL SOFTWARE * keeps a record of all your games – so you only need to tell it about each game once!

CAMBRIDGE COMPUTING

Cambridge Computing
1 Benson Street, Cambridge CB4 3QJ
Telephone: 0223 322905

To Cambridge Computing
1 Benson Street, Cambridge CB4 3QJ
Telephone: 0223 322905

Name_____

Address_____

_____

Please send me:
Joystick, Interface and Tape at £34.90☐ – Interface and Tape at £27.90☐ – Joystick only at £7.90☐ – For Spectrum

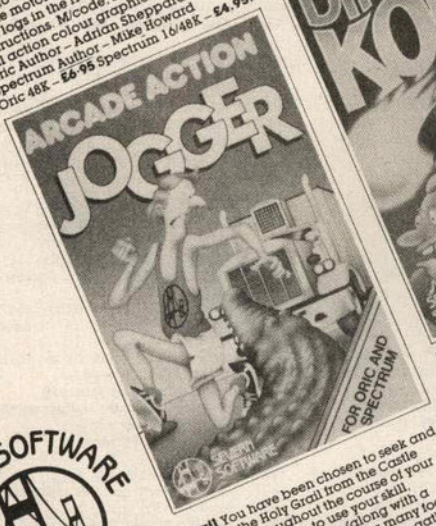
I enclose cheque/postal order * for £ . . . . . made payable to Cambridge Computing.
* delete as necessary.

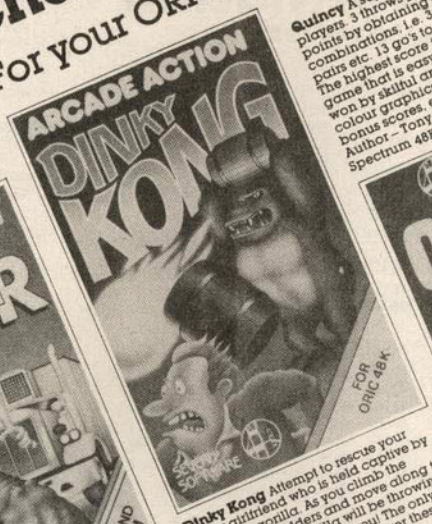
PCW

The REAL Challenge!

For your ORIC or SPECTRUM

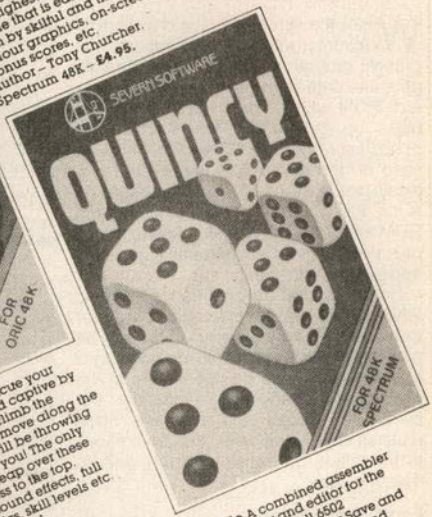
Jogger Guide your loggers across a 4-lane motorway and crocodile infested river to reach their safe haven through the gap in the fence. Each time a logger is safely home the next one will have to encounter more lorries and cars on the motorway but fewer crocodiles and logs in the river. Full on-screen instructions. Micode, sound effects and full action colour graphics.
Oric Author – Adrian Sheppard
Spectrum Author – Mike Howard
Oric 48K – **£6.95** Spectrum 16/48K – **£4.95.**





Dinky Kong Attempt to rescue your lovely girlfriend who is held captive by the angry gorilla. As you climb the connecting ladders and move along the gangways, the gorilla will be throwing barrels and fireballs at you! The only way to reach her is to leap over these obstacles and progress to the top. M/code action with sound effects, full colour action graphics, skill levels etc.
Author – Adrian Sheppard.
Oric 48K – **£6.95**

Quincy A superb dice game for 2 to 6 players. 3 throws per go to try and score points by obtaining certain combinations. I.e. 3 of a kind, a run, pairs etc. 13 go's to complete a game. The highest score is the winner! It's a game that is easy to learn but can be won by skilful and thoughtful play. Full colour graphics, on-screen instructions, bonus scores, etc.
Author – Tony Churcher.
Spectrum 48K – **£4.95.**



Oricade A combined assembler Disassembler and editor for the Oric. *Handles full 6502 Mnemonics. *Features Save and Reload M/C. *Assembles and disassembles at any address. *An essential tool for any serious programmer.
Author – Adrian Sheppard.
Oric 48K – **£8.50.**

Oric titles recommended by ORIC PRODUCTS INT. LTD.

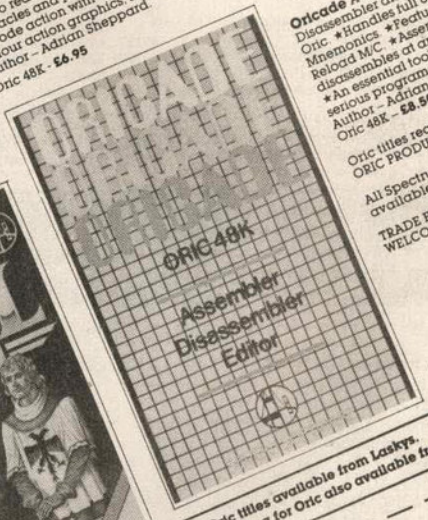
All Spectrum Software is available on Micronet 800.

TRADE ENQUIRIES WELCOME.

SEVERN SOFTWARE

SEVERN SOFTWARE
5 SCHOOL CRESCENT
LYDNEY
GLOUCESTER GL15 5TA

Grail You have been chosen to seek and recover the Holy Grail from the Castle Perilous. Throughout the course of your task you will have to use your skill, intelligence and logic (along with a little luck) as you encounter many foes. You will have the opportunity to gather weapons and armour to fight with, but if you are wounded your strength will drain away – many other features such as warp, jewels etc.
Author – Adrian Sheppard.
Oric 48K – **£6.95.**



Moria A challenging adventure game set in the mines of Moria. You'll have to try and survive encounters with the monsters of middle-earth while trying to locate Durins Ring. The Wizard and the Trader may help or hinder you on your journey to find and open the hidden doors to freedom – a game that will really test your character and staying power.
Oric Author – Adrian Sheppard
Spectrum Author – Mike Howard
Oric 48K – **£6.95** Spectrum 16/48K – **£4.95.**

All Oric titles available from Laskys.
Dinky Kong for Oric also available from WH Smith.

Please send me (Tick box)

SPECTRUM 16/48K
- ☐ Jogger @ £4.95
- ☐ Quincy @ £4.95
- ☐ Moria @ £4.95

ORIC 48K
- ☐ Jogger @ £6.95
- ☐ Dinky Kong @ £6.95
- ☐ Moria @ £4.95
- ☐ Oricade @ £8.50
- ☐ Grail @ £6.95

I enclose Cheque/P.O. for £_____ made payable to Severn Software

Name _____

Address _____

Severn Software, 5 School Crescent, Lydney, Gloucester GL15 5TA

All prices include VAT and P&P.

Overseas P&P add 50p.

Character information

***Les Allan** presents a program to transfer data from ROM into RAM*

Where the video interface chip gets its character information is important to graphic programming. Normally, the chip gets this data from the Character Generator ROM which stores the patterns that make up the various letters, numbers, punctuation symbols and other things as seen on the keyboard. One of the more significant features of the Commodore 64 is the ability to transfer these shapes from ROM into RAM and to alter these to create user defined graphics for games, business applications, etc.

However, data transfer from ROM into RAM can cause a considerable delay prior to the running of a program. This can be particularly annoying when de-bugging a routine which relies on this feature at the start of a program. The comparison between the Basic and machine code routines clearly indicates the advantages to be gained by transferring this data in machine code.

Functional listing

10	clear screen: printing colour purple
12	screen and border black
14-52	text and routine for comparison
36	initiate basic routine
40	print time taken (note timer turned off by keyscan interrupt)
48	initiate machine code routine
50	print time taken (note time taken is related to basic entry of machine code)
60-74	basic code routine
60	lower memory pointers
62	turn off keyscan interrupt timer
64	switch in character
66	transfer complete character set (upper case and lower case)
68	switch in I/O
70	restart keyscan interrupt timer
82-90	machine code routine
82	set variables
84	read data: poke into memory: keep running total of sum of data
86	error trap routine for incorrect data entry
88	action machine code
98-118	decimal code for machine code routine

Machine Code Routine

49152	load accumulator with 48 (12288/256)
49154	store in 52 (bottom of string pointer)
49157	store in 56 (top of memory pointer)
49160	load accumulator with 254
49162	logical AND with contents of 56334
49165	store in 56334
49168	load accumulator with 251
49170	logical AND with contents of 1
49173	store in 1
49176	load x register with 0
49178	load accumulator with x increment starting 53248
49181	store with x increment starting 12288
r9184	load accumulator with x increment starting 53504
49187	store with x increment starting 12544
49190	load accumulator with x increment starting 53760
49193	store with x increment starting 12800
49196	load accumulator with x increment starting 54016
49199	store with x increment starting 13056
49202	load accumulator with x increment starting 54272
49205	store with x increment starting 13312
49208	load accumulator with x increment starting 54528
49211	store with x increment starting 13568
49214	load accumulator with x increment starting 54784
49217	store with x increment starting 13824
49220	load accumulator with x increment starting 55040
49223	store with x increment starting 14080
49226	load accumulator with x increment starting 55296
49229	store with x increment starting 14336
49232	load accumulator with x increment starting 55552
49235	store with x increment starting 14592
49238	load accumulator with x increment starting 55808
49241	store with x increment starting 14848
49244	load accumulator with x increment starting 56064
49247	store with x increment starting 15104
49250	load accumulator with x increment starting 56320
49253	store with x increment starting 15360
49256	load accumulator with x increment starting 56576
49259	store with x increment starting 15616
49262	load accumulator with x increment starting 56832
49265	store with x increment starting 15872
49268	load accumulator with x increment starting 57088
49271	store with x increment starting 16128
49274	increment x register by 1
49275	branch forward 3 if equal to 0
49277	jump to 49178 until x register equals 0.
49280	load accumulator with 4
49282	logical OR with contents of 1
49285	store in 1
49288	load accumulator with 1
49290	logical OR with contents of 56334
49293	store in 56334
49296	load accumulator 240
49298	logical AND with contents of 53272
49301	logical OR with 12
49303	store in 53272
49306	return to Basic ■

```
10 PRINTCHR$(147)CHR$(156)
12 POKE53280,0:POKE53281,0
14 PRINTTAB(9)"DATA TRANSFER ROUTINES"
16 PRINT:PRINT:PRINTCHR$(159)
18 PRINTTAB(2)"THESE  TWO   ROUTINES  WI
   LL  CLEARLY"
20 PRINT
22 PRINTTAB(2)"DEMONSTRATE  THE ADVANTAG
   ES IN USING"
24 PRINT
26 PRINTTAB(2)"A MACHINE CODE  ROUTINE
   TO TRANSFER"
28 PRINT
30 PRINTTAB(2)"THE CHARACTER SET FROM RO
   M INTO RAM."
32 PRINT:PRINT:PRINTCHR$(152)
34 PRINTTAB(7)"TRANSFER OF DATA BY BASIC"
36 GOSUB60
38 PRINTCHR$(129)
40 PRINTTAB(7)"TIME TAKEN..... ";CHR$(
   158)"72 SECS"
42 PRINT:PRINTCHR$(152)
44 PRINTTAB(4)"TRANSFER OF DATA BY MACHI
   NE CODE"
46 PRINTCHR$(30)
48 GOSUB82
50 PRINTTAB(7)"TIME TAKEN..... ";CHR$(
   153);INT((T2-T1)/60);"SECS"
52 GOTO52
54 :
56 REM ## BASIC CODE ROUTINE ##
58 :
60 POKE52,48:POKE56,48
62 POKE56334,PEEK(56334)AND254
64 POKE1,PEEK(1)AND251
66 FORI=0TO4095:POKE12288+I,PEEK(53248+I
   ):NEXT
68 POKE1,PEEK(1)OR4
70 POKE56334,PEEK(56334)OR1
72 POKE53272,(PEEK(53272)AND240)OR12
74 RETURN
76 :
78 REM ## MACHINE CODE ROUTINE ##
80 :
82 T=0:SUM=0:T1=TI
84 READA:IFA<>-1THENPOKE49152+T,A:T=T+1:
   SUM=SUM+A:GOTO84
86 IFSUM<>15392THENPRINT"  ERROR IN DATA
   STATEMENTS   STOP!!!!":STOP
88 SYS49152:T2=TI
90 RETURN
92 :
94 REM ## DATA FOR MACHINE CODE ROUTINE
   ##
96 :
98 DATA169,48,141,52,0,141,56,0,169,254,
   45,14,220,141,14,220
100 DATA169,251,45,1,0,141,1,0,162,0,189
   ,0,208,157,0,48
102 DATA189,0,209,157,0,49,189,0,210,157
   ,0,50,189,0,211,157
104 DATA0,51,189,0,212,157,0,52,189,0,21
   3,157,0,53,189,0
106 DATA214,157,0,54,189,0,215,157,0,55,
```

```
   189,0,216,157,0,56
108 DATA189,0,217,157,0,57,189,0,218,157
   ,0,58,189,0,219,157
110 DATA0,59,189,0,220,157,0,60,189,0,22
   1,157,0,61,189,0
112 DATA222,157,0,62,189,0,223,157,0,63,
   232,240,3,76,26,192
114 DATA169,4,13,1,0,141,1,0,169,1,13,14
   ,220,141,14,220
116 DATA169,240,45,24,208,9,12,141,24,20
   8,96
118 DATA-1
120 :
122 :
124 REM ######################
126 REM ######################
128 REM ###                  ###
130 REM ### DATA TRANSFER ###
132 REM ###                  ###
134 REM ### COMMODORE  64 ###
136 REM ###                  ###
138 REM ###   LES ALLAN    ###
140 REM ###                  ###
142 REM ###    9.12.83     ###
144 REM ###                  ###
146 REM ######################
148 REM ######################
```

Address Decml	Hex	Machine Code			Assembly Code Program	
49152	C000	A9	30		LDAIM	48
49154	C002	8D	34	00	STA	52
49157	C005	8D	38	00	STA	56
49160	C008	A9	FE		LDAIM	254
49162	C00A	2D	0E	DC	AND	56334
49165	C00D	8D	0E	DC	STA	56334
49168	C010	A9	FB		LDAIM	251
49170	C012	2D	01	00	AND	1
49173	C015	8D	01	00	STA	1
49176	C018	A2	00		LDXIM	0
49178	C01A	BD	00	D0	LDAX	53248
49181	C01D	9D	00	30	STAX	12288
49184	C020	BD	00	D1	LDAX	53504
49187	C023	9D	00	31	STAX	12544
49190	C026	BD	00	D2	LDAX	53760
49193	C029	9D	00	32	STAX	12800
49196	C02C	BD	00	D3	LDAX	54016
49199	C02F	9D	00	33	STAX	13056
49202	C032	BD	00	D4	LDAX	54272
49205	C035	9D	00	34	STAX	13312
49208	C038	BD	00	D5	LDAX	54528
49211	C03B	9D	00	35	STAX	13568
49214	C03E	BD	00	D6	LDAX	54784
49217	C041	9D	00	36	STAX	13824
49220	C044	BD	00	D7	LDAX	55040
49223	C047	9D	00	37	STAX	14080
49226	C04A	BD	00	D8	LDAX	55296
49229	C04D	9D	00	38	STAX	14336
49232	C050	BD	00	D9	LDAX	55552
49235	C053	9D	00	39	STAX	14592
49238	C056	BD	00	DA	LDAX	55808
49241	C059	9D	00	3A	STAX	14848
49244	C05C	BD	00	DB	LDAX	56064
49247	C05F	9D	00	3B	STAX	15104
49250	C062	BD	00	DC	LDAX	56320
49253	C065	9D	00	3C	STAX	15360
49256	C068	BD	00	DD	LDAX	56576
49259	C06B	9D	00	3D	STAX	15616
49262	C06E	BD	00	DE	LDAX	56832
49265	C071	9D	00	3E	STAX	15872
49268	C074	BD	00	DF	LDAX	57088
49271	C077	9D	00	3F	STAX	16128
49274	C07A	E8			INX	
49275	C07B	F0	03		BEQ	3
49277	C07D	4C	1A	C0	JMP	49178
49280	C080	A9	04		LDAIM	4
49282	C082	0D	01	00	ORA	1
49285	C085	8D	01	00	STA	1
49288	C088	A9	01		LDAIM	1
49290	C08A	0D	0E	DC	ORA	56334
49293	C08D	8D	0E	DC	STA	56334
49296	C090	A9	F0		LDAIM	240
49298	C092	2D	18	D0	AND	53272
49301	C095	09	0C		ORAIM	12
49303	C097	8D	18	D0	STA	53272
49306	C09A	60			RTS	

SPECTRUM JOYSTICK INTERFACE

KEMPSTON COMPATABLE

£9.95
(TWO-YEAR GUARANTEE)

ROBUST JOYSTICK

£9.75

QUICKSHOT JOYSTICK

£11.95

FROM: RAM ELECTRONICS (FLEET) LTD (PCW), 106 Fleet Road, Fleet Hampshire GU13 8PA. (02514) 5858
Send cheque or postal orders or ring with your Access or Visa card number

Enter quantity required in box

- ☐ Spectrum Joystick Interface @ **£9.95**
- ☐ Robust Joystick @ **£9.75**
- ☐ Quickshot Joystick @ **£11.95**
- ☐ Interface + Robust Joystick @ **£18.50**
- ☐ Interface + Quickshot Joystick @ **£19.95**
- ☐ Vic 20 standard 16K ram pack @ **£27.95**
- ☐ Vic 20 switched 16/3K ram pack @ **£34.95**
- ☐ Vic 20 switched 32/16/3K ram pack @ **£49.95**

ALL PRICES INCLUDE VAT
PLEASE ADD £1 p&p
(OVERSEAS ORDERS £3)

I enclose £.....

Charge my Access/Visa £.....

Name.....

Address.....

.....

.....

******* Joystick Interface and ram packs carry an unbeatable two-year guarantee ********

TO: RAM ELECTRONICS (FLEET) LTD (PCW), 106 Fleet Road, Fleet, Hants GU13 8PA
(Credit card payment for goods by return post.)

Britannia Software

STOMPING STAN

Machine Code Arcade Action. Help STAN THE MAN collect his keys to the next card in this highly addictive game **£4.95** (48K only).

HOME RUNNER

Machine Code Arcade Type Game. Can you run HOME to the next screen in the all action, musical game? **£4.95** (48K only).

GRAND PRIX DRIVER

is a 3D full machine code Formula One racing car game. Can you reach the chequered flag ahead of the field? Excellent Sound and Graphics — Keyboard, Interface 2 or Kempston type joystick selectable. Fully compatible with 'Currah' Micrc Speech and Interface One . . . **£6.95** (48K only).

Trade enquiries welcome

BRITANNIA SOFTWARE CO LTD
116 Woodville Road
CARDIFF CF2 4EE
Tel: 0222-25803

VISA

Britannia Software

Cheques/POs payable to BRITANNIA SOFTWARE. Prices include P&P and VAT. All orders are processed on receipt.

SPRITES FOR THE DRAGON

Merlin's Sprite Magic offers a whole host of new features for the Dragon

Up to 128 sprites. Size up to 40 x 40 in mode 4, even larger in other modes. Sprite magic uses the 256 x 192 grid for screen addressing. Sprites are programmable for joystick control and/or keyboard control. Sprites may be defined as missiles fired from other sprites in response to fire-button or keyboard. Sprites may be programmed to rebound (like a bouncing ball), or wrap round, or disappear automatically when they get to the edge of the (user defined) screen. A wide range of commands and functions offers comprehensive control of speed, direction, screen edge behaviour and collision detection.

Animation is easily implemented with DRWG function which swaps the drawings being used for sprites and they needn't even be the same size.

Some of the commands are exceptionally powerful . . . MOVEn moves a single sprite, MOVEn,n moves a block of sprites, MOVEM moves all the sprites. All the MOVE commands observe the individual direction, screen-edge, joystick and keyboard instructions for the various sprites. The REPORT function reports how many have crashed. The HIT function reports crashed sprite numbers.

Sprites are non-destructive i.e. they do not leave a "trail". They're fast and they're efficient and they're easy to use.

The Dragon now has its very own BEEP command. This one, however, offers a range of 16 pre-programmed gunshots, explosions, sirens, laser sounds and the like. You can also program your own . . . BEEP (six parameters) lets you generate the kind of noises you have heard on other high quality software.

Keyboard handling has had some attention too . . . optional auto-repeat, INKEY function returns ASCII code, KEY function does the same, but waits for a keypress. CLEAR key clears hi-res screen and homes the print cursor.

We have also included a couple of routines to provide text on the hi-res screen . . . in all 5 PMODES with enhanced cursor controls providing relative as well as absolute positioning, PAGE command, HOLD command (to fix headers or graphics), COLOUR command changes text foreground and background colours etc. The hi-res screen is used just like the Basic text screen, including editing. You can also re-define the character set using the friendly new command CHR(n)=eight row values.

Sprite Magic requires absolutely no knowledge of machine code. The comprehensive manual describes the new Basic commands in full, with lots of examples. As well as the documented demonstration program, the cassette includes Character and Sound Generators, Mate in two (yes you can!), Shooting Gallery and Breakout. Price £17.25 all inclusive.

Access

MERLIN (MICRO SYSTEMS) LTD,
93 HIGH STREET, ESTON, CLEVELAND
Tel: (0642) 454883

BARCLAYCARD VISA

Audiogenic LTD

ATTENTION PROGRAMMERS

OBJECTIVE To increase the range of computers we service taking into account new machines on the horizon that are destined to make a large impact on the consumer market.

REQUIRED 4 programmers of high ability and proven track record on popular micros to work with us on new projects of your choice related to our existing product portfolio. Working in a place of your choice but in close contact with our present staff of 23 people.

REWARD For your abilities you would expect to earn in excess of £30,000 per annum in a financial environment designed to let you retain the maximum amount through prudent tax and legal advice.

CONTACT in writing and in strictest confidence giving full details of your career to date with examples of your work if possible. Mark your application Confidential and address it to Martin Maynard. I will arrange an informal meeting without obligation to discuss our plans.

AUDIOGENIC LTD
34-36 Crown Street
Reading, Berks

WIN THE POOLS?

SPECTADRAW 2 — THE BEST SELLING POOLS PREDICTION PROGRAM FOR THE 48K ZX SPECTRUM

The program looks at the recent form of the teams playing in each week's English and Scottish football league matches and then refers to a large database to see what has happened in the past when teams with similar form met. By combining the lessons learnt from the past with the teams' current league position, the program generates a draw probability factor for each match. It can then identify the matches which are likely to yield draws and output suitable predictions. It will also output the least likely draws for the benefit of those who prefer the fixed odds lines on coupons.

Program, 8000 match database (both on high quality cassette) and instruction manual £12.95 inclusive.

NEW!!! SPECTASORT — THE PERM GENERATION PROGRAM

Spectasort takes the 14 most likely and 10 least likely draw predictions and produces ten 8 from 10 full over perms, enabling you to complete your pools coupon directly from the screen. The program will run on its own in 16K, using your own predictions, or has the unique feature of being able to merge with SPECTADRAW 2 to provide a complete Pools Prediction package!!

Spectasort program on high quality cassette £4.95 inclusive.

(Chequest/POs payable to B.S. McAlley)

SPECTADRAW
1 Cowleaze, Chinnor, Oxford OX9 4TD

NOW OPEN!

SOFT TOUCH OF LONDON

YOUR NEW SOFTWARE DEALER IN NW5, STOCK A LARGE SELECTION OF PROGRAMS AND ACCESSORIES FOR MOST OF THE POPULAR MICROS

COME AND SEE US NOW AT:

12 DARTMOUTH PARK HILL
LONDON NW5
(100 yards from Tufnell Park Tube)

Tel: 01-263 3842

NB. EFFICIENT MAIL ORDER AVAILABLE
SAE BRINGS LATEST LIST

Open Forum **is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.**

Las Vegas

on Vic 20

Full instructions are included in the program for this game. The game is written for a 3.5K Vic20 and has been written in two parts. The first part must always be loaded and run before the second part as this is the part which sets up the udg's and tells the instructions.

The second part is the game itself, there is a little room for improvement mainly adding more colour and sound. One thing I forgot to add in the instructions is that every time you drop a coin you lose a chance and after you have lost three chances then you are sacked.

To make getting to the game (bonus) easier you must do the following and change line 34 to the following:

IF RIGHT£ (SC£,2) = "50" OR RIGHT£ (SC£,2) = "00" THEN GOTO *000 £ = dollar

Program notes

1-8	Setting up of the game
9	Prints the man on the screen
10	Take character which is pressed
11-12	Act on which character is pressed
13-17	Prints data on score etc
18	Prints coin/deletes old coin
19-24	Move coin down one if already on the screen and if no coin on screen put one on
25-27	Check if the coin has been missed on. If it has reset it back to the top
28-31	If coin is caught then add to score and make noise
33-34	Check if score is 100 200 etc, and if it is goto bonus game
35	Go back to the start of the loop 'line 8'
1000-1014	Print instructions for the bonus game
1113-1151	The playing of the bonus game
2000-2010	End of the game. If high scorer take and store name.
3000-3003	Sound when a coin has been caught

```
0 GOSUB62
2 PRINT"■INSTRUCTIONS
4 PRINT"YOU HAVE BEEN HIRED TO";
5 PRINT"COLLECT THE MONEY THAT";
6 PRINT"THE GAMBLERS AT THE"
7 PRINT"■COMMODORE■ CASINO DROP.■"
8 PRINT"YOUR PAY IS ONLY A "
9 PRINT"MEGRE 10% OF THE MONEY";
11 PRINT"■AS A BONUS YOU ARE"
12 PRINT"ALLOWED TO PLAY YOUR-"
13 PRINT"SELF EVERY TIME YOU "
14 PRINT"COLLECT A HUNDRED £'S"
15 PRINT"■■PRESS ANY KEY TO CONT!■";
16 POKE198,0:WAIT198,1:POKE198,0
17 PRINT"■■■THIS MONEY IS NOT TAX-";
18 PRINT"ED OR ALTERED IN       ANYWAY."
19 PRINT"■CONTROL:-
20 PRINT"    ,-LEFT"
21 PRINT"    .-RIGHT"
22 PRINT"[F1]-STARTS WHEEL"
23 PRINT"    *-STOPS WHEEL"
24 PRINT"■GOODLUCK"
25 PRINT"■INSTRUCTIONS
27 PRINT"■■■■■■■■■■■■■■■■■■PRESS ANY KEY
   TO CONT!■";
28 POKE198,0:WAIT198,1:POKE198,0
29 PRINT"■PLEASE WAIT"
30 POKE52,28:POKE56,28:CLR
31 FORI=7168TO7679:POKEI,PEEK(I+25600)
   :NEXT
32 FORI=7168TO7279:READA:POKEI,A:NEXT
33 POKE36869,255
34 DATA2,116,24,24,60,126,60,24
35 DATA63,127,96,96,96,96,255,255
36 DATA222,254,6,6,6,6,255,255
37 DATA48,48,32,63,33,56,168,236
38 DATA0,0,0,255,255,186,40,56
39 DATA24,60,126,255,255,126,60,24
40 DATA0,0,0,0,7,15,15,15
41 DATA0,0,0,0,255,255,255,255
42 DATA0,0,0,0,224,240,240,240
43 DATA15,15,15,15,15,15,15,15
44 DATA240,240,240,240,240,240,240,240
45 DATA15,15,15,15,255,255,255,255
46 DATA255,255,255,255,255,255,255,255
47 DATA240,240,240,240,255,255,255,255
48 FORI=7280TO7359:READA:POKEI,A:NEXT
49 DATA120,68,68,120,68,68,68,120
50 DATA24,36,66,66,126,66,66,66
51 DATA66,66,66,66,126,66,66,66
52 DATA60,24,24,24,24,24,24,60
53 DATA60,66,129,129,129,129,66,60
54 DATA129,193,161,145,137,133,131,129
55 DATA66,66,66,66,66,66,66,60
56 DATA62,66,64,56,4,4,68,120
57 DATA120,68,68,120,64,64,64,64
58 DATA36,36,36,60,4,4,36,24
59 POKE36869,240
60 PRINT"■NOW NEW THIS PROGRAM  AND LOAD
   THE NEXT PARTOF THE PROGRAM."
61 END
62 PRINT"■■  ■■■■ ■■■                  ■  ■ ■ ■
   ■  ■■■■ ■■■                ■  ■ ■  ■"
63 PRINT"■■■ ■ ■ ■■■"
64 PRINT"■■■  ■ ■ ■■■■ ■■■■■ ■■■■ ■■■■  ■ ■ ■
   ■■    ■ ■ ■    ■ ■ ■■■■ ■ ■■■ ■■■■ ■■■■";
65 PRINT"  ■ ■ ■   ■  ■ ■ ■   ■   ■  ■■■■
   ■■■■■ ■ ■ ■■■■"
66 PRINT"          BY PAUL HAMPSON"
67 PRINT"■■INSTRUCTIONS (Y OR N)"
68 GETA$:IFA$=""THEN68
69 IFA$="Y"THENRETURN
70 IFA$="N"THEN29
71 GOTO68

1 HI=0
2 PRINT"■":POKE36869,255:SC=0:BN=0:G=0:
  L=3:A=6:C=0
3 PRINT"■":D$(1)="■■■■■■■■■■■■■■■■■■
```

```
19 IFC=0THENS=INT(RND(1)*3)+1
20 B=RND(1):IFB>.05THENC=1
24 IFC=1THEND$(S)=D$(S)+"■":D$(S+3)=D$
   (S)+"■":X=X+22
25 IFS=1ANDX>196THEND$(S)="■■■■■■■■■■■■■■■
   ":X=0:C=0:L=L-1:IFL<1THENGOTO2000
26 IFS=2ANDX>196THEND$(S)="■■■■■■■■■■■■■■■
   ■■■■":X=0:C=0:L=L-1:IFL<1THENGOTO2000
27 IFS=3ANDX>196THEND$(S)="■■■■■■■■■■■■■■■
   ■■■■■■■■■":X=0:C=0:L=L-1:IFL<1THEN2000
28 IFA=6ANDS=1ANDX=176THENSC=SC+1:C=0:
   X=0:PRINTD$(S);" ":D$(S)="■■■■■■■■■■■
   ■■■■":GOSUB3000
29 IFA=10ANDS=2ANDX=176THENSC=SC+1:C=0:
   X=0:PRINTD$(S);" ":D$(S)="■■■■■■■■■■■
   ■■■■■■■■":Q=1
30 IFA=14ANDS=3ANDX=176THENSC=SC+1:C=0:
   X=0:PRINTD$(S);" ":D$(S)="■■■■■■■■■■■
   ■■■■■■■■■■■■":Q=1
31 IFQ=1THENGOSUB3000
33 SC$=STR$(SC)
34 IFRIGHT$(SC$,2)="00"THENGOTO1000
35 GOTO8
1000 POKE36869,240:PRINT"■BONUS GAME
     WELL DONE"
1001 PRINT"F1=STARTS WHEEL"
1002 PRINT"* STOPS ALL THE WHEELS";
1003 PRINT"■■111=PAYS £10"
1004 PRINT"222=PAYS £20"
1005 PRINT"333=PAYS £50+EXTRA GO"
1006 PRINT"■■■■PRESS ANY KEY TO CONT!■";
1007 POKE198,0:WAIT198,1:POKE198,0
1010 PRINT"■":POKE36869,255
1011 PRINT"■LLLLLLLLLLLLLLLLLLLLLLLNRS ";
     BN;"@  ";G
1012 PRINT"■■■■LLLLLLLLLLLLLLLLLLLLLL"
1013 PRINT"■■■■■■■■■■■■FGGGH I   J
     KLLLM"
1014 GETF$:IFF$<>"■"THEN1013
1113 Z=0
1114 A1=INT(RND(1)*3)+1
1115 A2=INT(RND(1)*3)+1
1116 A3=INT(RND(1)*3)+1
1117 C1=48+A1:C2=48+A2:C3=48+A3
1118 POKE7861,C1:POKE7862,C2:POKE7863,
     C3:POKE38581,5:POKE38582,5:POKE38
     583,5
1137 FORI=1TO10:GETH$:IFH$<>""THEN
     GOTO1142
1138 NEXT
1142 IFH$="*"THEN1145
1144 GOTO1114
1145 IFA1=1ANDA2=1ANDA3=1THENBN=
     BN+10:L=1
1146 IFA1=2ANDA2=2ANDA3=2THENBN=
     BN+20:L=1
1147 IFA1=3ANDA2=3ANDA3=3THENBN=
     BN+50:L=1
1148 IFA1=3ANDA2=3ANDA3=3THENG=G+1
1149 IFL=1THENL=0:GOTO1010
1150 IFG>0THENG=G-1:GOTO1010
1151 FORI=1TO1500:NEXT:A=6:SC=SC+1:GOTO3
2000 POKE36869,240
2001 PRINT"■YOU'RE FINISHED AT
     THE COMMODORE CASINO. "
2002 PRINT"YOU COLLECTED ";SC/10+BN;"£'S
2003 Q=(SC/10)+BN
2004 IFQ>HITHENINPUT"NAME";N$:HI=Q:
2005 PRINT"HI-SCORER IS NAMED     ";N$
2006 PRINT"PLAY AGAIN (Y OR N)   "
2007 GETS$:IFS$=""THEN2007
2008 IFS$="Y"THENGOTO2
2009 IFS$="N"THENPRINT"■":END
2010 GOTO2007
3000 POKE36878,15
3001 POKE36876,200:FORI=1TO100:NEXT
3002 POKE36876,0
3003 POKE36878,0:Q=0:RETURN
```

Las Vegas
by Paul Hampson

SPECIAL CASSETTE OFFER!

Collector's edition of
Eye of the Star Warrior
for 48K Spectrum

Popular Computing Weekly is offering its readers the chance to buy **Eye of the Star Warrior** — a graphic arcade adventure cassette for the 48K Spectrum written by Tony Bridge and Roy Carnell. All you have to do is cut out this coupon, fill it in, and send it together with the coupons from the next four issues and £1.25 (plus 30p p&p) to:

Popular Computing Weekly
Special Offer
Eye of the Star Warrior
12-13 Little Newport Street
London WC2R 3LD

Notes
1) Each order must consist of five coupons cut from the magazine together with £1.25 (plus 30p p&p)
2) Please allow 28 days for delivery
3) Please note that **Eye of the Star Warrior** is the program contained in **Spectrum Adventures** published by Sunshine.

Name .....

Address .....

.....

.....

.....

(1)

Special Offer!
Eye of the Star Warrior

Meteor Storm

on Dragon 32

This is a version of the popular arcade game in which you must travel as far as possible through a meteor storm without crashing into a meteor. Movement is controlled by the right joystick.

The program is written entirely in machine code. To enter it, type in the machine code loader and then enter the figures either as a separate group of two, or multiples of two. S will stop the loader. It very easy to make mistakes so be careful. Once you have finished save it immediately using *Csavem* "Meteorst", 13824,14680, 856. Run the program using *Exec* 13824.

PROGRAM OF THE WEEK

```
3600: 7E 36 95 60 7C 63 7E 60 59 4F 55 60 48 49 54
360F: 60 41 60 4D 45 54 45 4F 52 6D 59 4F 55 60 41
361E: 52 45 60 44 45 41 44 04 59 4F 55 60 47 4F 54
362D: 60 54 48 52 4F 55 47 48 60 54 48 45 60 53 54
363C: 4F 52 4D 04 41 4E 4F 54 48 45 52 60 47 41 4D
364B: 45 60 68 59 6F 4E 69 60 7F 04 4D 45 54 45 4F
365A: 52 60 53 54 4F 52 4D 04 42 59 04 4D 6E 4A 45
3669: 4E 4E 49 4E 47 53 04 50 52 45 53 53 60 43 60
3678: 54 4F 60 50 4C 41 59 60 04 53 43 4F 52 45 7A
3687: 60 04 48 49 6D 04 05 6B 84 CA 70 70 70 70 86
3696: 70 B7 04 19 B7 04 1A B7 04 1B B7 04 1C 86 3C
36A5: BA FF 23 B7 FF 23 8E 80 AC BF 36 8F 8E 05 6A
36B4: BF 36 8D 86 F7 B4 FF 22 B7 FF 22 8E 36 91 B6
36C3: 04 19 A7 80 B6 04 1A A7 80 B6 04 1B A7 80 B6
36D2: 04 1C A7 80 BD BA 77 8E 04 00 86 E2 A7 89 01
36E1: E0 86 E8 A7 80 8C 04 20 26 F1 8E 04 20 86 E8
36F0: A7 84 86 E4 A7 88 1F 30 88 20 8C 05 E0 26 EF
36FF: 8E 36 55 10 8E 04 69 BD 39 3E 8E 36 62 10 8E
370E: 04 AE BD 39 3E 8E 36 65 10 8E 04 EA BD 39 3E
371D: 8E 36 70 10 8E 05 A5 BD 39 3E BD B5 0A 81 43
372C: 26 F9 BD BA 77 86 08 BA FF 22 B7 FF 22 8E 36
373B: 81 10 8E 04 00 BD 39 3E 8E 36 89 10 8E 04 0F
374A: BD 39 3E 8E 36 81 BD 39 3E 86 70 B7 04 07 B7
3759: 04 08 B7 04 09 B7 04 0A 8E 36 91 A6 80 B7 04
3768: 19 A6 80 B7 04 1A A6 80 B7 04 1B A6 80 B7 04
3777: 1C CE 36 03 37 32 FE 36 8D 36 32 8E 05 DF A6
3786: 82 81 6A 26 10 E6 88 20 A7 88 20 86 60 A7 84
3795: C1 60 10 26 01 20 8C 04 00 26 E5 8E 05 E0 86
37A4: 60 A7 80 8C 06 00 26 F9 BE 36 8F 10 8E 04 20
37B3: C6 6A A6 80 81 78 2D 04 E7 A4 20 04 86 60 A7
37C2: A4 8C BF FF 26 06 8E 80 00 BF 36 8F 31 21 10
37D1: 8C 04 3F 26 DF BF 36 8F BD 80 12 B6 01 5A BE
37E0: 36 8D 5F 81 15 2E 09 8C 05 65 2D 32 30 1F 20
37EF: 0B 81 2A 2D 2A 8C 05 80 2E 25 30 01 BF 36 8D
37FE: A6 1E 81 6A 26 02 C6 01 A6 1C 81 6A 26 02 C6
380D: 01 CE 36 03 37 32 FE 36 8D 36 32 C1 01 10 27
381C: 00 B4 C6 5E BE 36 8D B6 FF 00 81 7E 27 06 81
382B: FE 27 02 20 0E E7 88 DD 86 FF B7 FF 20 4A 26
383A: FD B7 FF 20 8E 04 40 A6 80 81 5E 26 18 E6 88
3849: DF A7 88 DF 86 60 A7 1F C1 60 27 0A 86 FF A7
3858: 88 DF 4A 81 5F 26 F8 8C 05 DF 26 DD 86 FF B7
3867: FF 20 4A 26 FD B7 FF 20 B6 04 0A 4C 81 7A 27
3876: 05 B7 04 0A 20 34 86 70 B7 04 0A B6 04 09 4C
3885: 81 7A 27 05 B7 04 09 20 22 86 70 B7 04 09 B6
3894: 04 08 4C 81 7A 27 05 B7 04 08 20 10 86 70 B7
38A3: 04 08 B6 04 07 4C 81 7A 27 35 B7 04 07 10 8E
38B2: 09 C4 31 3F 26 FC 16 FE C7 C1 5E 26 13 86 80
38C1: A7 88 20 B7 FF 20 4C 26 F7 86 60 A7 88 20 16
38D0: FE C9 BD 39 4C 8E 36 08 10 8E 04 40 BD 39 3E
38DF: 7E 38 EF BD 39 4C 8E 36 26 10 8E 04 40 BD 39
38EE: 3E B6 04 07 B1 04 19 2E 1E 2D 2C B6 04 08 B1
38FD: 04 1A 2E 14 2D 22 B6 04 09 B1 04 1B 2E 0A 2D
390C: 18 B6 04 0A B1 04 1C 23 10 8E 04 07 10 8E 04
391B: 19 A6 80 A7 A0 8C 04 0B 26 F7 8E 36 40 10 8E
392A: 04 80 BD 39 3E BD B5 0A 81 4E 27 22 81 59 10
3939: 27 FD 75 20 F1 A6 80 81 04 27 14 A7 A0 10 BF
3948: 00 88 20 F2 8E 04 20 86 60 A7 80 8C 06 00 26
3957: F9 39 7E 7E 7E 7E 7E 7E 7F FF FF FF FF FF FF
```

```
10 ' HEXADECIMAL M/C LOADER
20 CLS:S=13824
30 PRINT HEX$(S);:INPUT M$
40 IF M$="S" THEN END
50 P$=LEFT$(M$,2)
60 M$=MID$(M$,3)
70 POKE S,VAL("&H"+P$)
80 S=S+1:IF M$="" THEN 30 ELSE 50
```

Meteor Storm
by Michael Jennings

3D Maze

on Spectrum

When the program is run it displays a title with instructions. The program then computes the maze. When it has finished computing the maze it gives you the option of seeing the maze. You must try to remember the way through your maze. If you get through your score is placed in the hall of fame providing it is less than 200.

The program has a machine code subroutine to clear part of the screen so it is advisable not to test the program until you have entered the data at line 1810.

Program notes

70-120	Main loop
200-280	Print maze
300-510	Draw maze
1000-1100	Make maze
1200-1290	Move
1300-1380	Title
1400-1550	End of game
1600-1620	Draw maze (2D)
1700-1720	Display
1800-1810	Auto save and data

```
    1 REM AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
    2 POKE 23658,8
    3 RESTORE : FOR X=23760 TO 23781: READ A: POKE X,A: NEXT X
    5 BORDER 0: PAPER 0: CLS : INK 7
   10 LET TITLE=1310: LET PRINT=200: LET DRAW=310: LET MOVE=1200: LET END=1400
   20 DIM A(7): DIM B(7): DIM C(7): DIM D(7): DIM F$(4,5): DIM T(10): DIM T$(10,11): DIM M$(3)
   30 FOR G=1 TO 10: LET T(G)=200: LET T$(G)="": NEXT G
   40 LET F$(1)="SOUTH": LET F$(2)="WEST ": LET F$(3)="NORTH": LET F$(4)="EAST ": LET M$(1)=" ": LET M$(2)=CHR$ 143: LET M$(3)="E"
   50 FOR I=1 TO 7: LET A(I)=88-2*I+2: LET B(I)=88-2*I+2: LET C(I)=88+2*I+2: LET D(I)=88+2*I+2: NEXT I
   55 LET A(7)=1: LET B(7)=1: LET C(7)=175: LET D(7)=175: NEXT I
   60 GO SUB TITLE
   70 LET T=0: LET F=2: LET X=2: LET Y=2: LET M=0: CLS : GO SUB 1700
   80 GO SUB PRINT
   90 GO SUB MOVE
   95 LET T=T+1
  100 IF M<>1 THEN GO TO 80
  110 GO SUB END
  120 GO TO 70
  200 REM PRINT
  210 PRINT AT 3,26;F$(F)
  220 LET E=6: LET V=X: LET W=Y: RANDOMIZE USR 23760
  230 IF E=0 OR M(V,W)=1 THEN GO TO 270
  235 GO SUB DRAW
  240 LET V=V+(F=1)-(F=3)
  250 LET W=W+(F=2)-(F=4)
  260 GO TO 230
  270 LET E=E+1: PLOT A(E),B(E): DRAW C(E)-A(E),0: PLOT A(E),D(E): DRAW C(E)-A(E),0
  280 RETURN
  300 REM DRAW
  310 IF M(V,W)=2 THEN INK 2
  320 IF M(V,W)<>2 THEN INK 7
  390 LET G=E+1
  400 PLOT A(E),B(E): DRAW 0,D(E)-B(E)
  410 PLOT C(E),B(E): DRAW 0,D(E)-B(E)
  420 IF M(V,W-1)=1 AND F=1 OR M(V,W+1)=1 AND F=3 OR M(V+1,W)=1 AND F=2 OR M(V-1,W)=1 AND F=4 THEN GO TO 450
  430 PLOT A(E),B(E): DRAW A(G)-A(E),0: PLOT A(E),D(E): DRAW A(G)-A(E),0
  440 GO TO 460
  450 PLOT A(G),B(G): DRAW A(E)-A(G),D(E)-A(G): PLOT A(G),D(G): DRAW A(E)-A(G),D(E)-D(G)
  460 IF M(V,W+1)=1 AND F=1 OR M(V,W-1)=1 AND F=3 OR M(V-1,W)=1 AND F=2 OR M(V+1,W)=1 AND F=4 THEN GO TO 490
  470 PLOT C(E),B(E): DRAW C(G)-C(E),0: PLOT C(E),D(E): DRAW C(G)-C(E),0
  480 GO TO 500
  490 PLOT C(G),B(G): DRAW C(E)-C(G),B(E)-B(G): PLOT C(G),D(G): DRAW C(E)-C(G),D(E)-D(G)
  500 LET E=E-1
  510 RETURN
 1000 REM MAKEMAZE
 1010 DIM M(21,21): RANDOMIZE : FOR X=1 TO 21: LET M(X,1)=1: LET M(X,21)=1: LET M(1,X)=1: LET M(21,X)=1: NEXT X
 1020 FOR X=3 TO 19 STEP 2: FOR Y=3 TO 19 STEP 2: LET M(X,Y)=1: NEXT Y: NEXT X
 1030 FOR X=1 TO 70: LET M(INT (RND*17+3),INT (RND*17+3))=1: NEXT X
 1040 LET G=INT (RND*12+5): LET H=INT (RND*12+5): LET E=0
 1050 IF M(G+1,H)=1 THEN LET E=E+1
 1060 IF M(G-1,H)=1 THEN LET E=E+1
 1070 IF M(G,H-1)=1 THEN LET E=E+1
 1080 IF M(G,H+1)=1 THEN LET E=E+1
 1090 IF E=3 THEN LET M(G,H)=2: RETURN
 1100 GO TO 1040
 1200 REM MOVE
 1210 LET A$=INKEY$: LET X1=X: LET Y1=Y: LET F1=F
 1220 LET F=F+(A$="M")-(A$="N")
 1230 IF F=0 THEN LET F=4
 1240 IF F=5 THEN LET F=1
 1250 IF A$="A" THEN LET X1=X1+(F=1)-(F=3): LET Y1=Y1+(F=2)-(F=4)
 1255 IF A$="E" THEN LET T=300: CLS : GO SUB 1430: GO TO 70
 1260 IF M(X1,Y1)=0 OR M(X1,Y1)=2 THEN IF X1<>X OR Y1<>Y THEN LET X=X1: LET Y=Y1: GO TO 1280
 1270 IF F=F1 THEN GO TO 1210
 1280 IF M(X,Y)=2 THEN LET M=1
 1290 RETURN
 1300 REM TITLE
 1310 PRINT PAPER 0; INK 6;"
      D-MAZE 3
 1320 PRINT '' INK 4;"YOU ARE TRAPPED IN A MAZE"''"YOU MUST ESCAPE OR DIE!!"''" The exit is in a ful-de-sac"'', INK 6;" Use keys:"''"N>TURN LEFT"''"M>TURN RIGHT"''"A>ADVANCE"''"E>GIVE UP"
 1330 GO SUB 1000
 1340 PRINT '' FLASH 1; INK 2; PAPER 6;"DO YOU WANT TO SEE THE MAZE(Y/N)"
 1350 LET A$=INKEY$
 1360 IF A$="Y" THEN GO SUB 1600
 1370 IF A$="" THEN GO TO 1350
 1380 RETURN
 1400 REM END
 1410 CLS : PRINT INK 7; FLASH 1; BRIGHT 1; "          CONGRATULATIONS
 1420 PRINT INK 6''"You escaped from the maze in";T;" moves"
 1430 PRINT INK 5;"HI-SCORES:"
 1440 INK 3: FOR X=1 TO 10: IF T(X)>T THEN FOR J=9 TO X STEP -1: LET T(J+1)=T(J): LET T$(J+1)=T$(J): NEXT J: LET T(X)=T: INPUT "Enter your name",T$(X): LET X=10
 1450 NEXT X
 1460 PRINT AT 7,0;: FOR X=1 TO 10: PRINT INK 2;T$(X),T(X): NEXT X
 1470 PRINT INK 7; INVERSE 1''''"  PRESS ANY KEY TO PLAY AGAIN
```

```
1480 PAUSE 4E4
1490 CLS : PRINT INK 7;"SAME MAZ
E(Y/N)"
1495 IF INKEY$<>"" THEN GO TO 14
95
1500 LET A$=INKEY$
1510 IF A$="N" THEN PRINT : PLA
SH 1;"COMPUTING MAZE": GO TO 333
0
1520 IF A$<>"Y" THEN GO TO 1500
1530 IF INKEY$<>"" THEN GO TO 15
30
1540 GO TO 1340
1550 RETURN
1600 CLS : PRINT INK 5;AT 5,28;"
N";TAB 28;"↑": BRIGHT 1: INK 7:
PRINT AT 0,0;: FOR R=1 TO 21: PR
INT TAB 5;: FOR Q=21 TO 1 STEP -
1: PRINT M$(M(R,Q)+1);: NEXT Q:
PRINT : NEXT R
1610 PRINT " PRESS ANY KEY TO C
ONTINUE": PAUSE 4E4
1620 RETURN
1700 INK 7: PRINT AT 2,25;"Facin
g:"
1710 PRINT AT 5,23;"Use keys";TA
B 23;"A>ADVANCE";TAB 23;"N>LEFT"
;TAB 23;"M>RIGHT";TAB 23;"E>GIVE
IN"
1720 RETURN
1800 CLEAR : SAVE "3D-MAZE" LINE
1: VERIFY "3D-MAZE"
1810 DATA 6,192,17,10,0,33,0,64,
197,5,22,54,0,35,16,251,237,90,1
93,16,243,201
```

3D Maze
by G Richards

Attack

on Lynx

This is an all-action arcade game for the Lynx computer with ordinary memory.

Program notes

80-210	Pokes graphic chr$
220-370	Main routine
380-490	Fire routine
500-690	Draws the screen
740-780	Score and makes the game faster
1100-1320	The instructions

```
10 CLS
20 PROC INSTRUCTIONS
30 REM SPACESHIP
40 PROC UDG
50 LET A=58,B=90,a=0,C=0,s=0,M=0,S=0,c=100
55 LET A$=GET$
56 CLS
60 PROC PRINT 1
70 GOTO  LABEL CONTROL
80 DEFPROC UDG
90 DPOKE GRAPHIC,HIMEM
100 FOR I=0 TO 79
110   READ A
120   POKE LETTER(128)+I,A
130 NEXT I
140 DATA 63,33,49,33,49,33,49,33,49,33
150 DATA 49,33,49,33,49,33,49,33,33,63
160 DATA 63,62,60,60,56,56,48,48,32,32
170 DATA 63,31,15,15,7,7,3,3,1,1
180 DATA 3,12,18,40,33,33,40,18,12,3
190 DATA 48,12,18,5,33,33,5,18,12,48
200 DATA 0,16,60,26,59,26,60,16,0,0
201 DATA 4,17,44,18,41,18,44,17,4,32
210 ENDPROC
220 LABEL CONTROL
230 PRINT  @ A+25,B+50;" ";
240 IF a=0 THEN  PROC PLACE
250 PROC MOVE
260 LET C=C+1
270 IF C>c THEN  GOSUB  LABEL NEXT C
280 INK 4
290 LET A=A+RAND(2)+1 MOD 70,B=B+RAND(3)
    MOD 135
300 PRINT  @ A+25,B+50;CHR$(134);
310 LET I=INP(&0480)
320 IF I=247 THEN  PROC FIRE
325 IF M>9 THEN  GOTO  LABEL END
330 GOTO 220
340 DEFPROC MOVE
350 LET I=INP(&0980),A=(A+(I=223)*2-
    (I=251)*2) MOD 70
360 LET I=INP(&0080),B=(B+(I=223)*5-
    (I=239)*5) MOD 135
370 ENDPROC
380 DEFPROC FIRE
390 INK 7
400 DOT 60,190
410 DRAW 120,120
420 DOT 180,190
430 DRAW 120,120
440 INK 0
450 DRAW 60,190
460 DOT 120,120
470 DRAW 180,190
480 INK 7
486 FOR I=1 TO 10
487   BEEP 100-I*10,50,63
489 NEXT I
489.1 IF A>=33 AND A<=36 AND B>=59 AND
    B<=69 THEN  GOSUB  LABEL BLOW
490 ENDPROC
500 DEFPROC PRINT 1
510 RESTORE 570
520 INK 2
530 FOR I=1 TO 21
540   READ A,B,C
550   PLOT A,B,C
560 NEXT I
570 DATA 4,10,0,2,50,50,2,195,50,2,230,0,4,
    110,0,2,120,50,2,130,0,4,120,0,2,120,
    50,4,50,50,2,50,195,2,195,195,2,195,50,4,
    120,115,2,120,118,4,120,125,2,120,122,4
    ,115,120,2,118,120,4,125,120,2,122,120
580 PRINT  @ 21,195;CHR$(18);CHR$(130);"<-
    25 SPACES ------> ";CHR$(131);CHR
    $(18);
590 PRINT  @ 18,205;CHR$(18);CHR$(130);"▲▲▲▲▲
    ";CHR$(132);CHR$(133);"▲▲"CHR$(128)
    ;"▲▲▲▲";CHR$(132);CHR$(133);"▲▲▲";CHR$
    (132);CHR$(133);"▲▲▲▲▲▲";CHR$(131);
    CHR$(18);
600 PRINT  @ 15,215;CHR$(18);CHR$(130);"
    10 SPACES ";CHR$(129);" <- 18  SPACES->
    ";CHR$(131);CHR$(18);
610 PRINT  @ 12,225;CHR$(18);CHR$(130);"
    <- 31  SPACES ------> ";CHR$(13
    1);CHR$(18);
615 PRINT  @ 30,0;"SCORE"; @ 68,0;"MISSED";
620 FOR I=1 TO 50
630   LET A=RAND(145)+50,B=RAND(140)+50,
    C=RAND(7)+1
640   INK C
650   DOT A,B
660 NEXT I
670 INK 7
680 PROTECT 2
690 ENDPROC
700 DEFPROC PLACE
710 PRINT  @ A+25,B+50;"  ";
720 LET A=RAND(66),B=RAND(140),C=0,a=1
720.5 FOR Q=1 TO 2
721   FOR I=1 TO 10
722     BEEP 100-1*10,90,60
723   NEXT I
724 NEXT Q
```

TO ALL SOFTWARE PRODUCERS!

Are you interested in a virgin market?

There's a British-owned company in Switzerland ready to handle your software, nationwide, on a mail-order basis. "Sofse" . . . is part of 'School of Spoken English', which provides courses throughout industry in Switzerland, so most of our students are interested in business and educational software for micros — but they all join the kids when it comes to games, just — with Swiss efficiency! — to make sure they work . . .

Send updated info., demo tapes, discs or cartridges, plus separate price lists including 1st class postage if applicable, plus usual replacement guarantees, for: CBM 64, VIC20, TANDY, TI 99, SPECTRUM (I, II, III), ZX81, SHARP MZ 700, IBM, SIRIUS, DRAGON 32. User instructions must be printed in German, French and preferably Italian. If none available, we can offer a translation service. N.B. There is no V.A.T. in Switzerland.

Please quote min/max mailing time and whether phone/letter orders. To:

ROGER WORROD,
"Sofse",
Place Bel-Air, 1
1003 Lausanne, Switzerland.
Tel: 010.41.21.876451

We can also offer nationwide distribution in Italy through: Roger Worrod, c/o ARCHIMEDES s.r.l., via Villa Magna 22, FIRENZE, Italy. Common Market invoices; user instructions IN ITALIAN.

TEACHERS AND EDUCATIONAL GAMES DESIGNERS

We are looking for top quality educational material for release on the BBC Model B, Elektron and Dragon computers. We can offer excellent royalties or outright purchase of copyright. Please send your work on cassette or call Mark at:

TIGER SOFTWARE

63 Devonshire Street
Monkweirmouth
Sunderland
Tyne and Wear
SL5 1PP

Tel: (0783-484592)

DRAGON 32/64 SOFTWARE

The highly acclaimed PERSONAL BANKING SYSTEM includes the following features:

- ★ Permanent records of your Bank Account
- ★ Single or sequential pages of entries
- ★ Automatic posting of standing orders
- ★ Full search facility with on-screen correction of any item
- ★ Full instructions and demonstration file included
- ★ Additional Bank Reconciliation module included to match your PBS items automatically with your Bank Statement
- ★ PLUS after sale maintenance

PRICE: £12.00 (cassette and manual)
£15.00 enhanced DRAGON DISC version (but excluding Bank Reconciliation module at present).

UTILITIES 1 — Three machine code programs in one:

- ★ CASSETTE CATALOGUE
- ★ COMPRESS (removes all REMS and spaces from BASIC programs)
- ★ COPY (makes backup copies of most BASIC and M/C programs)

PRICE: £5.00 (cassette)

DISASSEMBLER — all in machine code — Prints to either Screen or Printer in Hex and Mnemonics
PRICE: £5.00 (cassette)

32 MEMORY MAP — Over 9 A4 pages of memory locations in the DRAGON system
PRICE: £5.00 (booklet)

HILTON COMPUTER SERVICES

Hilton Computer Services Ltd
(Dept XX) 14 Avalon Road,
Orpington, Kent BR6 9AX

Ask for the PBS at your local computerstore.

POOLSWINNER

THE ULTIMATE POOLS PREDICTION PROGRAM

PREDICTS	Not just SCOREDRAWS, but NOSCORES, AWAYS and HOMES
IT WORKS	We **guarantee** the program performs significantly better than chance
ADAPTABLE	"Poolswinner" allows the precise prediction formula to be set by the user — you can develop and test your own unique method. Probabilities are given on **every** fixture — choose as many or as few selections as you wish
EASY TO USE	Fully menu driven, with detailed instruction booklet
DATABASE	The program comes complete with the largest database available — over 20,000 matches. The database automatically updates as results come in

APPLE, BBC (B), COMMODORE 64, DRAGON, SPECTRUM (48K), ZX81 (16K)
£15 (all inclusive)

We produce databases for those developing their own prediction program. Two years results £7.50. Five years results £12.50

Available from dealers, or direct (return of post) from . . .

BARCLAYCARD VISA

Selec Software

37 COUNCILLOR LANE, CHEADLE, CHESHIRE 061-428 7425
DEALER ENQUIRIES WELCOME

```
730 ENDPROC
740 LABEL NEXT C
750 PRINT  @ A+25,B+50;"  ";
760 PROC PLACE
770 LET M=M+1,s=s+1
775 PRINT  @ 69,20;M;"  ";
780 RETURN
820 LABEL BLOW
840 FOR I=1 TO 7
845   INK I
850   PRINT  @ A+25,B+50;CHR$(134);
860   PRINT  @ A+25,B+50;" ";
870   PRINT  @ A+25,B+50;CHR$(135);
880   BEEP 100,90,60
890 NEXT I
891 PRINT  @ A+25,B+50;" ";
895 PROC PLACE
896 LET S=S+1,c=c-3,s=s+1
897 PRINT  @ 35,20;S;"  ";
900 RETURN
910 LABEL END
920 WINDOW 27,96,53,193
930 VDU 1,0,2,5,23
940 PRINT
950 PRINT
960 PRINT
970 PRINT
980 PRINT
1010 PRINT
1020 PRINT "GAME OVER "
1030 PRINT
1040 PRINT "PLAY AGAIN Y/N"
1041 PRINT
1042 PRINT
1043 PRINT
1044 PRINT
1045 PRINT
1045.1 LET X$=GET$
1046 WINDOW 3,123,5,245
1047 VDU 1,4,2,0,4
1048 IF X$="Y" THEN  GOTO  LABEL AGAIN
1049 PROTECT 0
1050 CLS
1060 END
1070 LABEL AGAIN
1080 LET A=58,B=90,a=0,C=0,s=0,M=0,S=0,c=100
1090 GOTO  LABEL CONTROL
1100 DEFPROC INSTRUCTIONS
1110 PROTECT 0
1120 VDU 1,3,2,0,4
1130 PRINT  TAB 15;CHR$(24);"# ATTACK #"
1140 VDU 25
1150 PRINT
1160 PRINT
1170 PRINT
1180 PRINT  TAB 2;" YOU ARE IN CONTROL OF
     THE LAST SAS"
1190 PRINT  TAB 11;"(SPACE ATTACK SHIP)"
1200 PRINT
1210 PRINT  TAB 2;"      YOU MUST CHASE AND
     DESTROY"
1220 PRINT  TAB 2
1230 PRINT  TAB 2;"ALL INVADERS
     IN SPACE BEFORE THAY"
1240 PRINT  TAB 2;"TELEPORT THROUGH TO
     ANOTHER DIMENSION"
1250 PRINT
1260 PRINT  TAB 4;"USE ARROW KEYS TO MOVE
     AND SPACE BAR TO FIRE"
1270 PRINT
1280 PRINT  TAB 2;"IF MORE
     THAN 10 SHIPS GET THROUGH"
1290 PRINT  TAB 2;"THE GAME ENDS"
1300 PRINT
1310 PRINT  TAB 4;" PRESS ANY KEY TO CONTINUE
1320 ENDPROC
```

Attack
by A Smith

Microradio

GW6JJN

Packet radio

This week Microradio is in the news business. Well, I've received a press release anyway. The press release emanates from The Tucson Amateur Packet Radio Corporation and gives details of their new Terminal Node Controller (TNC).

Packet Radio is a very, very exciting thing. Here I am, week after week, talking about micros and radio, about adapting computers to existing modes of communication like Morse and RTTY, and at last it all comes together. A mode designed for the computer; digital information that is direct and faultless; messages, even programs, that can be sent without error either round the corner or across the world, and for free. Not a penny on the phone bill. So what is packet radio?

Packet radio is a means by which you can send the information in your computer's memory to another computer in small bursts or packets. A packet can be up to 256 characters long and, like a parcel, has address information and a verification technique to make sure that the packet received is the same as the packet sent. All that is needed is a micro, a transceiver and a terminal node controller (TNC).

A TNC is an interface or circuit board which encodes and decodes the packets. If the packet isn't verified on receipt, then the TNC makes it send it again, so it is error free. It's not even vital that the computers are the same because the transmission is in binary and the TNC takes care of everything.

In a sense, the TNC is a micro in its own right. Your computer can talk to the TNC through an RS232 interface and the TNC encodes the packets and sends them off instantly. As you type on your keyboard, the letters come up on your friend's screen and vice versa. You can say hello or send your latest space invaders creation. And most important of all, it's accurate and very, very fast. If your friends are not in, send the packet anyway and it will be stored for them until they want to access it.

A packet can be sent through repeaters and, much more exciting, through satellites. Packet radio has been operated successfully between New York and New Zealand via satellite Oscar 10 and plans are well advanced for a new PACSAT satellite. The speed of packet radio means that you could send an adventure game in the same space of time (pardon the pun). Exciting? Who said this was the age of the train?

A TNC costs 240 dollars, details from Tucson Amateur Packet Radio Corp, PO Box 22888, Tucson, Arizona 85734, USA. No doubt it will cost £150 or more here, but it does have 30K non volatile Ram on the board and almost as much in Rom. ■

Ray Berry GW6JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share, or topics that you would like to see covered, write to: Ray Berry, Microradio, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

Assassin Software

KRASOCASTLE — "Dungeon Adventure, The First Quest of Mogadishu the Elf" — 16/48K Spectrum

USURPER — Multi-player struggle for power in a fantasy world — 48K Spectrum

NEXT WAR — The best modern war simulation difficulty from novice to military genius, holocaust optional — 48K Spectrum

MOONRAKER — Two player space war game umpteen options — 48K Spectrum

£6.00 EACH
(Plus 50p p&p per order)

CHEQUES AND PO's PAYABLE TO

TOWN NATHAN
10 ASH ROAD
LEEDS 6

SPECTRUM SOFTWARE
COMPARE THESE PRICES

MELBOURNE HOUSE	
THE HOBBIT	£10.75
PENETRATOR	5.75
TERROR DACKTILL	5.75
IMAGINE	
ZZOOM	4.25
ZIP ZAP	4.25
AH DIDDUMS	4.25
ARCADIA	4.25
JUMPING JACK	4.25
MOLAR MAUL	4.25
POSTERN	
3D DEEP SPACE	6.25
MICROL	
VALHALLA	11.50
RICHARD SHEPHERD	
TRANSYLVANIAN TOWER	5.25
SUPER SPY	5.25
DEVILS OF THE DEEP	5.25
SHIP OF THE LINE	5.25
EVEREST ASCENT	5.25
VISIONS	
ORPHEOUS	6.75
RAPIDES	4.95
SHEER PANIC	4.95
STAR WARRIORS	5.95
PITMAN 7	5.95
PSS	
KRAZY KONG	4.95
PANIC	4.95
LIGHT CYCLE	4.95
HOPPER	4.95
DEEP SPACE	4.95

ALL PRICES INCLUDE VAT & P&P – ALLOW 21 DAYS FOR DELIVERY

PLEASE SUPPLY .....

TOTAL ENCLOSED £ .....

NAME .....

ADDRESS .....

SEND ORDERS TO:- **POSTAL COMPUTER SERVICES,** FREEPOST P.O. BOX 2, MIDHURST, WEST SUSSEX, GU29 9BR.

Home Computer Centre

29 Millcroft. Crosby, Liverpool L23 9XJ
Tel. 051-727 8050

ASTERFRET TRADING LTD. INCORPORATES HOME COMPUTER CENTRE

VIC 20 and CBM 64 are reg'd trade marks
Commodore Business Machines

Special Offer

16K STANDARD
£27.95

MOTHERBOARDS
VIC 20 4 SLOT SWITCHABLE – £28.95
CBM 64 4 SLOT SWITCHABLE – £29.95

LIGHT PENS
CBM 64 + FREE GAME – £28.75
VIC 20 + FREE GAME – £28.75

RAM PACKS
VIC 20 16K STANDARD – £27.95
VIC 20 16K SWITCHABLE – £35.95
VIC 20 32K SWITCHABLE – £49.95

ALL RAM PACKS CARRY 2 YEARS GUARANTEE

Please allow up to 21 days for delivery. All prices include V.A.T., postage and packing.

If you wish to be added to our mailing list, please tick the appropriate box

PLEASE SEND ME

Qty

- ☐ VIC 20
- ☐ CBM 64
- ☐ 16K Std. Ram Pack
- ☐ 16K Switchable Ram Pack
- ☐ 32K Switchable Ram Pack
- ☐ VIC 20 4 Slot Motherboard
- ☐ CBM 64 4 Slot Motherboard
- ☐ VIC 20 Light Pen
- ☐ CBM 64 Light Pen
- ☐ BBC Light Pen

Name _____
Address _____
_____

I enclose Cheque/PO for £ _____

Home Computer Centre

PCW

Adventure Quest

This week I have a query from Neil Scrimgeour who has been stuck for the past two months in Wintersoft's *Ring of Darkness*. This program, which has been such a success on the Dragon, has recently been released on the Spectrum.

Neil has a common problem. Despite completing the Dragon's sign quest and going down the labyrinth of doom, becoming a level two dwarf in the process, Neil seems unable to get any more money. I know how he feels.

With only 150 gold pieces, Neil cannot buy enough hit points or food to complete the quest. What Neil wants to know is whether there is any way he can gain money easily, apart from killing bandits?

Well, Neil, to some extent it depends on the character you choose at the beginning of the program. A thief, for example, can steal money or valuables to add to his wealth.

As a tip to other adventurers, Neil notes that it may be useful to have a bath plug when entering the aquarium in *Franklin's Tomb*.

Now, I am grateful to David Swain for the following reviews of *Adventure Quest* and *Snowball* from Level 9 Computing. As with other Level 9 adventures, these two programs are available on BBC, Commodore 64, Spectrum, Lynx, Nascom, Oric and Atari.

Adventure Quest is the second adventure in the *Middle Earth Trilogy* from level 9 computing and carries on from *Colossal*, an adventure about which much has been written. You are an apprentice magician and, because all others seem to have failed, you are given the chance to try and defeat the demon lord Agaliarept who resides in the dark tower.

The object of this adventure is firstly to search for and find the four stones, no mean feat in itself, and secondly to use these stones to enter the dark tower. Finally, you must defeat the demon lord by means of magic and a helpful companion.

Here we have an adventure with just about everything. You start outside a small brick building surrounded by forest, travel through swamps — ward off savage wolves — find cunningly hidden objects, then proceed, if you dare, across a dry arid desert. But, keep a wary eye for the giant sand worm, whose powers are mightier than the sphinx. Use its great powers, if you know how, climb mountain ranges to defeat giants and orcs in their castle — slip into dark caves and tumble into roaring underground torrents.

If you can open the rusted door, enter the vast cavern to fight off more orcs, giant spiders and dragons and then dare to enter a fire licking erupting volcano. Find your way through a swamp, avoiding grasping skeletal hands, Will O' wisps and vampires, to the very shadow of the dark tower.

Work out the combination for the locks and enter the demon lord's dark tower and, if you can defeat him, claim the title 'Grand Master Adventurer'.

This has always been one of the best adventures for me as it seems to contain the lot. In all it took me about eight months to solve. It has the usual *Save/Restore* facility and you do have three lives before you have to start all over again. As with *Colossal*, there is a puff of smoke and you find yourself elsewhere, not always to advantage.

A good little booklet setting the scene comes with the cassette and an envelope and hint token should you become hopelessly stuck.

Snowball 9 is the first adventure in the new *Silicon Dream Triology*. Here again, we have all the expertise we have come to expect from Level 9 Computing — this adventure has over 7,000 locations.

Snowball 9 is a colony starship launched in the 2190s from the EEC's Ceres Base, with thousands of colonists on board. Something has gone wrong and it is up to you, as Kim Kimberley, to rescue *Snowball 9* from disaster.

You are lying in a freezer coffin in total darkness, always a good one for openers. Extricate yourself from this and you find that you are in a mortuary. Travel a few paces and find that you are almost trapped in a vast cylindrical complex of many mortuaries — about 2,000 I believe, I didn't have time to visit them all, though I am sure you could. So, the sooner you learn the colour light coding system, the sooner doors begin to open into other parts of this vast starship.

The appeal of this adventure to me is the distinct lack of monsters — there are really only two slightly nasty guardians, the nightingale to be avoided at all costs and the rather stubborn waldroid. This does allow you to concentrate fully on how you are going to perform the various tasks.

In all, about 40 objects have to be found and used, but you can only carry about four at a time. You must adventure out into darkest space, across snowfields in shuttles and recreation areas where there are forests and snake pits, or are there? And on and on to Snowball's central control room and hopefully final success.

An absorbing adventure giving, I think, a good few hours of pleasure. My one reservation being that too much detail is built into the earlier parts of this adventure at the expense of the closing stages where lack of detail and problems makes the final rescue too simple and an max. However, I am now looking forward to paty two of the trilogy, *Return to Eden*. ■

Are you stuck in an adventure? Are you faced by a problem that seems insurmountable? *Adventure Helpline* may be the answer.

Adventure Helpline is, quite simply, designed to put adventurers in touch with one another. Where you may be stumped by a baffling puzzle, a fellow adventurer may be able to help. By the same token, you may be able to help other people with their problems.

If you are having difficulties with an adventure, fill in the accompanying coupon and send it to:

Adventure Helpline
Popular Computing Weekly
12-13 Little Newport Street
London WC2R 3LD

We shall publish *Adventure Helpline* entries each week in their own special column.

Adventure Helpline

Micro .....

Adventure .....

Problem .....

.....

.....

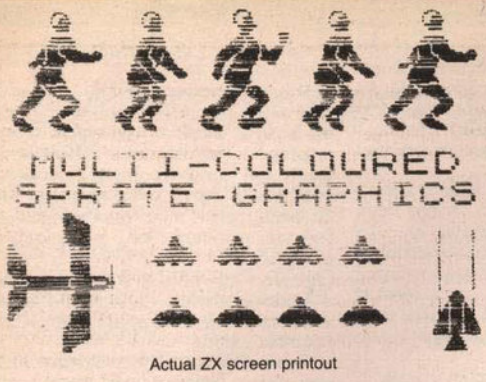
Name .....

Address .....

.....

.....

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to: Tony Bridge, Adventure Corner, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.



Actual ZX screen printout

NOW FOR THE 48K ZX SPECTRUM
MULTI-COLOURED SPRITE-GRAPHICS
A new UTILITY program: Replace User Defined Graphics with Multi-Coloured Sprites and greatly improve your games.

FEATURES:
Demonstration program : Character Generator program : Instruction program.
Create any size characters up to full screen.
Choose colour, bright and flash for each character square.
Save character data : Create animated characters.
Beginners guide on how to use Sprites.

Remarkable Machine code routine prints Multi-Coloured Sprites instantly. Unprints Sprites Fully restoring background.

Only £6 including p&p
From: B. SIDES SOFTWARE
4 Willesden Road, Cefn-Glas, Bridgend, South Wales CF31 4RE

HISOFT PASCAL DEVPAC

Quality ZX SPECTRUM* Software

HISOFT PASCAL 4T

"... I haven't seen any other compiler that could match Hisoft's Pascal" ... *Using the Spectrum Micro – Autumn 1983*
"This is a very impressive product ... of benefit to any Spectrum programmer ..." *David Bolton ZX COMPUTING Aug/Sept 1983*

Just two comments from full length reviews of our powerful and virtually full implementation of Standard Pascal. The advantages of using Pascal are well-known — fast, self-doumenting, and above all, structured programs and now, with Hisoft Pascal, you can reap all these benefits on a wide range of home computers, including the 48K Sinclair Spectrum! Hisoft Pascal produces programs that run typically 40 times faster than equivalent ZX BASIC programs and, sometimes, up to 1,000 times faster!

Hisoft Pascal supports FOR ... DO, WHILE ... DO, REPEAT ... UNTIL, CASE ... OF, INTEGERs, REALs, CHARacters, RECORDs, POINTERs, SETs, ARRAYs etc. etc. — it is not a Tiny Pascal but a virtually full implementation of the language allowing the user to develop true high-level language skills while attaining execution speed close to that of machine code. Complete with a 70-page manual.

HISOFT DEVPAC 3

"... DEVPAC is most highly recommended. The documentation is first class." *Your Computer May 1983*
"... *if you write programs in machine code, buy DEVPAC – it is the best currently on the market." Adam Denning, ZX SOFT in Which Micro September 1983*

Two comments from reviews of earlier versions of DEVPAC — **now** we have DEVPAC 3 available: a powerful Z80 assembler with conditional assembly, assembly from tape (to enable generation of very large code files), ORG, EQU, DEFB, DEFS, DEFW, DEFM, labels of any length — in fact all you need for fast (3,000 lines per minute) and powerful assembly programming. But it doesn't stop there: DEVPAC 3 also includes an incredible debugger/dis-assembler giving you a 'front panel' display of the Z80 system and allowing extensive debugging of your machine-code program, including single-stepping programs **EVEN IN ROM!!** Open up the secrets of low-level programming with DEVPAC 3.

Prices:
Hisoft Pascal 4T (ZX SPECTRUM) £25 inclusive
(NewBrain, SHARP MZ700 etc) £35 plus VAT
Hisoft DEVPAC 3 (ZX SPECTRUM) £14 inclusive
(NewBrain £25 inclusive

★★★**STOP PRESS**★★★ Hisoft Pascal for the SPECTRUM now comes complete with a Turtle Graphics package allowing fast and easy production of complex graphic displays

*and others

HISOFT
13 Gooseacre, Cheddington
Leighton Buzzard, Beds. LU7 0SR
Tel: (0296) 668995

HEY YOU !!!
SPECTRUM OWNER
DON'T MISS THESE

NEW RELEASE

FARMER-16K/48K Arcade Game.
All machine code - Super graphics.
Progressive difficulty feature
Bonus scores - User tested.

A highly addictive game - How good are you at avoiding Fox Hunts, Bulls, Lorries, Tractors, Etc. ?Can you 'out Fox' the Dog & Hen to save the corn ?

NEW RELEASE

ASSIGNMENT EAST BERLIN
48K Adventure Game.
Machine code search routines for fast response, quick save & auto vertify (10 secs each).

Have you got what it takes to survive as a Spy in East Berlin ? You will be pursued by Police at every turn, will you complete your Mission ? Who is the Thin Man ? What secret does the Blonde Hostess hide ?

Both games user tested before release.
Both games £5.95 each inc post & package.
Link Enterprises, 20 Derwent St, Consett, Co. Durham.

Name:_____

Address:_____

Please rush me, by return of post, within 48Hrs. At £5.95 each : Farmer. Assignment East Berlin. I enclose

Cheque / P.O. No. .....

MINATRON Brings You A SLICE Of The Action

All-Graphic HORROR For The 48K SPECTRUM

Satan's Pendulum

The Story So Far .....

Our heroine **Pixel Ramtop** lies naked and helpless in the **Torture Chamber** of the mad **Count Prospero.** Slicing through the air above, a **Razor-sharp Pendulum** begins its dreaded descent.

• • FEATURES • •

- **Cartoon Animated Graphics for Superb Realism**
- **Four Skill Levels**
- **Controlled** from the **Keyboard** or a **Kempston Joystick**
- **Three Different Scenes**
- **100% Machine Code** for speeds up to **Greased Lightning**
- **Comes Complete with a Booklet** explaining Rules, Strategy and **Much More .... We Reveal our Secrets** and show you how to use our **Techniques** to put **Cartoon Animation** into **Your Own Games.**

Inspired by the famous **Horror Stories** of Edgar Allan Poe, **SATAN'S PENDULUM** takes you into battle against **Serpents, Ghouls** and **Vampire-bats** and through to a superb **Blood-drenched** Conclusion in the **Torture Chamber** itself.

Order SATAN'S PENDULUM with confidence. If not delighted return immediately for a refund of your money.

AVAILABLE NOW by MAIL ORDER

£5.95 inc P&P

Send Cheque/P.O. for £5.95 to
MINATRON COMPUTING
34 PINEWOOD CLOSE
WESTBURY on TRYM
BRISTOL BS9 4AJ
Telephone. Bristol 623597

48K SPECTRUM ONLY

DEALER ENQUIRIES WELCOME

WHITE ON BLACK

M Henderson of Great Eastern Street, Cambridge, writes:

Q I have recently bought a ZX81, just to see how I and new technology mix. I have done the various tuning tricks to get a good screen picture, and I can now get an adequate display.

However, a friend says that somewhere she has seen an advertisement for a module that will improve the quality of the screen picture by reversing the black and white. Is this true and, if so, can you give me any details about it?

A I think you are describing the Fritch inverse video module. This gives a very good inverse display that is usually much clearer than the normal picture. It is available from D Fritch, 6 Stanton Road, Thelwall, Cheshire WA4 2SE. The cost is £7.50 if they fit it for you, or £4.00 if they send you a kit.

VIDEO SIGNALS

Y Henderson of St Ives, Huntingdon, Cambridgeshire, writes:

Q I have an Atari home computer, but recently I have become more interested in making home videos. As the magnetic tape is the same, is there anyway that I could record computer graphics and text on to my video films?

A Yes, it is possible. But, I do not know of any system commercially available for the home computer market.

What you need is a video mixing unit. This will allow you to mix more than one video signal on to a single tape. It then sends the mixed signal to the modulator for display on a screen. Although it may sound the same as sound mixing, and the theory is approximately the same, the greater amount of information that needs to be stored for a television picture makes it correspondingly more complex.

DIRECT COMMAND

Paul Gurney of Hereford Road, Hereford, writes:

Q I have a 16K Spectrum and on page 16 of the manual it says that if you enter as a direct command *Clear 23800* it will give you an idea of what happens when the memory becomes full. All I get when I do this is *M-Ramtop no good*. This happens even when I switch on and enter this at once. Is this meant to happen, or have I got something wrong with my Spectrum?

Also, can you tell me how to use both *Attr* and *Screen$* on my Spectrum as I do not understand them from the manual? How do you use *Screen$* to find out what is printed at a certain position on the screen?

A To answer the second part of your question first, *Screen$* is a command not well documented in the otherwise excellent Sinclair manual, which would have you believe it is only useful for saving pictures onto tape. In fact, the format *Print Screen$ (y,x)* means print the character found at line *y*, column *x*. You can use this to determine events according to a given screen postion by using a line like *If Screen$ (15,20) = "A" Then Print "Bang"*. The problem is, though, that *Screen$* can't recognise user defined characters, so in practice you won't find much use for it in games.

Instead, you should use *Attr* which reads a value at a given point on the screen — that value depends on the colour of the square and whether it is flashing or not — look in the manual for the exact formula you need. If, for example, you have a green flashing alien and you need to know if he has reached a particular point on the screen, you would find out the *Attr* value for green flashing and have a line like *If Attr (x,y) = (value for green flashing) Then . . .*

The *Clear* command is simpler to explain. The memory of the computer has been assigned to different tasks and is divided up accordingly. Normally, there is a certain amount of room for Basic programs. Supposing, though, you need more room and your program does not require any user defined graphics — by moving Ramtop up in memory you will give yourself that room by overwriting the section usually reserved for user defined graphics.

By typing *Clear 23800* you are deliberately allowing yourself no space for Basic whatsoever and thus you get the response *Ramtop no good*. It has been moved too far down.

BASIC COMPILER

Douglas Lockhard, of Elie Place, Barnhill, Broughty Ferry, Dundee, writes:

Q My Dad and I have decided to buy a ZX Spectrum. I am aware that it is still early days yet, but I was wondering if you knew of a Basic compiler that was available for the Spectrum (the thought of being able to write programs in Basic, and then have them converted to machine code, seems very inviting)? If you do not know of one, could you please write out, or explain how to write, a compiler?

A The idea of a compiler is very attractive — instant machine code at the touch of a button! But, it's not as simple as it sounds. Some Basic commands cannot be compiled, some types of dimensioned strings for example. The end result may have the speed of machine code, but it will usually take up a lot more memory than a program written in code from the start.

What a compiler will do is speed up most, straightforward, arcade type games, thus making them more exciting and competitive than the often plodding results you get from ordinary Basic.

Fortunately, there are a couple of commercial compilers available so I don't have to spend the next 27 Peek and Pokes explaining how to write one! The two I know of are *Softek 'FP' Basic Compiler* £19.95, Softek, 329 Croxted Road, London SE24, and *M Coder*, £9.95, from PSS, 452 Stoney Stanton Road, Coventry CV6 5DG. Softek also do a stripped down version of the above compiler for £9.95.

STARRY NIGHT

Colin Langveld of Lisholme Road, Liverpool, writes:

Q I would be obliged if you can help with what must be a very simple matter. I have a space ship, (value *X*) trying to make a planet fall, with the sky full of stars. The trouble is that as the ship descends, it wipes out the stars. I know that the answer is to *Peek*, but how do I use this command on my Vic20? Perhaps its my age. They say that by the time you reach 40 you lose *X* bytes every day.

A The answer to your problem is simple, if a bit cumbersome. You are quite right in assuming that a *Peek* is the answer. I guess you are using the full stop for your stars, which have an Ascii code of 46. What you need to do is *Peek* the appropriate screen location and see if it has a value of 46; ie, if a star (full stop) can be found there.

To prevent the ship 'rubbing out' stars, use a variable to record the position of the ship and look at the screen location 22 spaces further on; ie, the next square. *Peek* this square to see if it contains 46 (a star). Now you need to store this fact by recording the screen address using a variable. So *If Peek* (the memory address of the square 22 on from the ship) = *46 Then Let x* = (the address above). As soon as your ship has moved past the square, *Poke x* with 46 and you have your star back.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW*, 12-13 Little Newport Street, London WC2R 3LD.

ZX81, SPECTRUM, DRAGON BBC AND VIC

SOFTWARE LENDING LIBRARY

We have for hire from **50p** (including postage) programs for your computer.

£5 for life membership (less than the cost of a single game) brings you the Software Lending Library membership kit including catalogue, newsletter.

All tapes lent with full manufacturer's permission.

Send a cheque or postal order for **£5** to **Software Lending Library,** PO Box 3, Castleford, West Yorks stating name, address, and computer type.

NEW IN THE NORTH-WEST

- ★ ELECTRONIC COMPONENTS
- ★ WILL REPAIR POPULAR MICROS AND PRINTERS AT LOW PRICES
- ★ APPLE AND EPSOM SPECIALISTS
- ★ ZX81 AND SPECTRUM ADD-ONS

Open 9 am—8 pm Monday—Saturday

MANCOMP LTD

PRINTWORKS LANE
LEVENSHULME, MANCHESTER 19
M19 3JP. Tel: 061 224 1888

TALLENT MICRO

LYNX

— YOUR COMPUTER

TO EXCELLENT SOFTWARE

M/C PROGRAMMERS — ENHANCE THE POWER OF YOUR MONITOR WITH

SUPERMON	EXTASSY
SINGLE STEP	TWO PASS
DISASSEMBLER	ASSEMBLER

£7.50 each for listing and program explanation

TALLENT MICRO

18B NEW ROAD, WOODSTON
PETERBOROUGH, CAMBS PE2 9HA

OLTROSOFT

MAIL ORDER ONLY

BETTER SOFTWARE AT BETTER PRICES

OLTRO HOUSE (DEPT PCW), 31 KEITH PARK ROAD, UXBRIDGE, MIDDLESEX

SALE SALE SALE SALE SALE

To make room for new stock we are offering a limited number of the following at these ridiculous prices:

SPECTRUM

IMPACT Startrek £4.95
IMAGINE Zip Zap £4.65
MIKRO-GEN
Cosmic Raiders, Mines of Saturn . each £4.95

DRAGON 32

CABLE Drone £7.25
GEM Monster Mine, Sultans Maze. ..... each £5.95

CBM 64

INTERCEPTOR Frogger, Krazy Kong, Startrek ..... each £5.50
ANIROG Frogrun, 3D Time Trek, and Skramble ..... each £4.95

VIC 20

LLAMASOFT Abductor, Laserzone, Matrix ..... each £4.95
ROMIK Space Attack, Power Blaster ..... each £4.95

BUT HURRY, SALE ENDS JANUARY 31, 1984

SEND SAE FOR OUR CATALOGUE
(PLEASE STATE MACHINE)

DISCOUNT SOFTWARE

HUGE DISCOUNTS OFF MOST COMPUTERS
12-PAGE CATALOGUE, INCLUDING:

	RSP	Our Price
SPECTRUM		
Manic Miner (Bug-Byte)	£5.95	£4.95
Ant Attack (Quicksilva)	£6.95	£5.95
Hobbit (Melbourne)	£14.95	£11.99
COMMODORE 64		
Everest Ascent (Shephard)	£6.50	£5.00
Ski Run (Boom)	£5.50	£4.50
BBC		
Slicker Puzzler (DK'Tronics)	£6.95	£5.95
Dictator (DK'Tronics)	£6.95	£5.95
ORIC		
Asteroids (Artic)	£5.95	£4.95
Bozy Boa (CDS)	£5.95	£4.95
DRAGON		
Chess (J. Morrison)	£7.95	£6.95
Leggit (Imagine)	£5.50	£4.50

CWO P&P 55p 1 Tape, 2 or more Post Free. SAE for 12-page catalogue of software for most computers, to:
DISCOUNT SOFTWARE, 45 Brunswick, Bracknell, Berks

THE Ω RUN

..... IS HERE

POPULAR Computing WEEKLY Back Issues

Almost all the copies of **PCW** that you missed can still be bought as back issues for only 50p, including postage and packing.

An **Index** of the contents of the 36 issues published in 1982 is now available from the Publishers for only £1.20. It includes full details of all the programs, routines, reviews and news that you might have missed.

Please send me the following back issues at 50p each:

Total £

Please send me a copy of the 1982 PCW Index at £1.20 ☐
I enclose a cheque postal order for £

Name

Address

Please return to Back Issues, PCW, 12-13 Little Newport Street, London WC2R 3LD.

LWS

VIC20 CBM64 OWNERS!!!

BUY DIRECT FROM THE MANUFACTURERS AND SAVE POUNDS!!!

3-SLOT SWITCHABLE MOTHERBOARDS. VIC20 **£18.95**; CBM 64 **£19.50**
4-SLOT SWITCHABLE MOTHERBOARDS. VIC20 **£21.50**; CBM 64 **£22.50**

CBM 64/VIC20 CASSETTE INTERFACE
Allows you to use your computer with a standard cassette deck **£12.50**

NEW NEW NEW
ROBOT DRIVE INTERFACE
Plugs into the Vics or 64S user port and gives complete computer control of DC motors. Contains all the circuitry for stop start and reverse. Comes complete with software cassette giving full instructions and control program. **£18.95**

COMING SOON
WANT TO BUILD A DROID?
We are currently testing a large range of robot components that can be assembled in many different forms, ie. swivelling base units motorised arms gripper units. DC motor and gearbox drive units with optical encoders and much, much more!!!
All prices inclusive of VAT and P&P.

L. W. STAINES & CO, UNIT 2 RODING TRADING ESTATE
LONDON ROAD, BARKING, ESSEX IG11 8BU Tel: 01-591 2900

CLASSIFIED

Semi-display — £5 per single cc
Lineage — 20p per word

CALL *DIANE DAVIS* ON *01-437 4343* FOR SEMI/DISPLAY ADVERTISING

GAMES SOFTWARE

Why pay full price in the shops?
When you can get your games from us for
UP TO 50% OFF!
Send today for comprehensive *free lists*, **stating computer** and get our
FREE INTRODUCTORY OFFER!
ATLANTIS GAMES,
Dept. PCW. 28 Tile Kiln Lane, Hastings, East Sussex.

VIC20 GAMES. Special offer from Tournament Software. Two super, highly original tapes for standard Vic; Tournament 1: Automania, Astradodge, Crossover, Trogmen. Tournament 2: Headshrinker, Luna, Gypsy Rose Vic, Vicbuz. Outstanding quality. Great sound, colours, hi-res graphics, music, animation. Buy now at special offer £7 for both tapes, each tape alone at £3.95 (inclusive). Tournament Software, 63 Mansion Court Gardens, Thorne, Doncaster, South Yorks DN8 5BH. Sae for details.

£3.00 OFF
VALHALLA
HOBBIT + BOOK
only £11.95 incl
STATE COMPUTER
Cheques/POs to Telequip
Victory House
Somers Road North
Portsmouth, Hants (0705) 750011

VIC20 SOFTWARE. Four games £3.99, eight for £6.99. Unbeatable value! Superb sound. Amazing graphics. Amp, 59 Morse Road, Norwich NR1 4PL.

ORIC 1. Horse Racing. Analyses any race in seconds. Gives selections. Each horse's chance shown. Cassette £4.50. N. Beasley, 14 Rae Street, Edgeley, Stockport, SK3 9LJ.

SPECTRUM 16/48K. "Raquel" presents her games pack for aged 16 and over only (state age when ordering). Still only £3.50. I. Brooks, 17 Malvern, Coleman Street, Southend, Essex.

SPECTRUM SUPER PROGRAM TAPES, each containing 20 programs including: Tape 1: Invaders, Defender, Frogger, Pontoon, Logo. Tape 2: Dodgems, Tron, Blitz, Panic, Detective, Hangman. Tape 3: Invisible, Radiation, Blackhole, Sound. Tape 4: Dollars, Mazes, Asteroids, Anagram, Tunes. Special New Year offer, any tape £4. Two tapes £6. Three tapes £8. Four tapes £10. All sent by return of post. Cheques to: J. Loach, 8 Cottesford Close, Hadleigh, Suffolk.

VIC20
You've played ordinary Adventure. Games. Now try
KINGDOM OF VARGO
Hours of fun and frustration. Makes Rubik's Cube seem like child's play . . .!
Probably hardest game on Market
BUT IT CAN BE DONE
Only £4.99 and worth every penny!
★ POP STAR ★
Beat the greedy experts and rogue managers to get your record to No. 1. Different game every time. Only £3.
★ GRAND NATIONAL ★
Name you own horse. Race commentary, betting tipster's, trainer's reports etc. Different game every time. £3.
FREE! Alien Slayer with every two or more purchases
Cook, 21 Hollymead, Carshalton, Surrey

48K SPECTRUM ADVENTURE. Find the 11 Kings Treasure, 70 locations, fast response time, £400. Send cheques to: J. G. Martin, Partney, Spilsby, Lincolnshire.

UNUSED SPECTRUM SOFTWARE. Penetrator, 3D Tunnel, 3D Knot, £3.50 each; Hobbit £10.50. Also ZX Microdrive Book, £3.75. Tel: Bolton 691887.

Softcell presents
Bomber Run
for CBM 64
Les Allan's Star Game with interrupt based machine code, for fast, smooth action. Features include: Hall of Fame, five skill levels, demo-mode.
£4.95 including p&p.
To: Softcell, 28 Atkinson Drive, Newport, Isle of Wight, PO30 2LJ.
Cheques and POs. Enquiries, Tel: 0983 525737 or 0983 295955

CLUBS

VIDEO GAME CLUB by the Spectrum specialist. Tel: 01-459 0831 for details of special offer and catalogue of latest software available.

CRS EXPRESS. Reliable software exchange club for the BBC Micro. Send SAE for details. 7 Carlton Mews, Heighington, Lincoln, LN4 1RB.

UTILITIES

DRAGON KOPYKAT on cassette. Makes back-up copies of most machine-code programs — including protected auto-run, £5.95. D. Gill, 82 Carlton Hill, London NW8 0ER.

SPECTRUM TRADE SECRETS, amazing booklet includes making programs unlistable, unstopable, invisible. How to list/reveal such, etc. Send £3. ZX Guaranteed, 29 Chadderton Drive, Unsworth, Bury, Lancs.

COMMODORE 64
DATA FILES
HOMEFILE cassette allows the whole family to save, update and search files of records on any subject — hobbies, education or business.
Full instructions included — no programming needed.
£10.00 inclusive
JAGA,
30 Chestnut Grove, Etwall, Derby, DE6 6NG

SPECTRUM 007 SPY COPIER. Makes back-up copies of all your tapes, guaranteed easiest to use; guaranteed to copy more types than any other copier. No gimmicks, therefore can copy even a full 16K/48K program. Note: only 007 Spy can also copy tapes to microdrive. Send £3.95 to: ZX Guaranteed, 29 Chadderton Drive, Unsworth, Bury, Lancs. Tel: 061-766 5712.

SPECTRUM KOPYKAT
IMPROVED PERFORMANCE
Simply the best. Copying **any** program is now as easy as LOADing and SAVEing your own programs. **Any ZX Spectrum** program can be backed-up onto a fresh tape. Even programs that cannot be stopped can now be copied. 100 per cent machine code. Copies headerless files. Prints file name. SPECTRUM KOPYKAT uses no program area so **full size** programs **over** 41.7K (9K for 16K machines) are easily duplicated. PLUS **FREE** Header Reader program. **Immediate despatch by first class return of post.**
Send cheque/PO for £4.95 to:
MEDSOFT
61 Ardeen Road, Doncaster, DN2 5ER
IT CAN EVEN COPY ITSELF

SPECTRUM TRADE SECRETS. New booklet includes how to make programs unstoppable, unlistable, invisible. How to reveal such. With hints/tips and Microdrive supplement. £3. ZX-GUARANTEED, 29 Chadderton Drive, Unsworth, Bury, Lancs.

AMAZING SPECTRUM CASSETTE. Lets you Stop/study Machine-Code programs. Includes a program to transfer Bytes to Microdrive. Send £3.50 and quote Study 2. ZX-GUARANTEED, 29 Chadderton Drive, Unsworth, Bury, Lancs.

BACK-UP TAPE COPIERS
New and unique machine code programs that can provide security back-up copies of most software currently available. Supplied on cassette with simple instructions for the following machines.

COMMODORE 64	£5.95
VIC 20	£5.95
BBC MODEL A/B	£5.95
ORIC 1	£5.95
SPECTRUM 16/48K	£4.95

Price includes VAT, post, and packing.
Send cheques and P.O.s to:
WALLTONE LTD.
Crown Courtyard, Bridge Street, Evesham, Worcestershire

CLASSIFIED ADVERTISING RATES:

Line by line: 20p per word, minimum 20 words.

Semi-display: £5 per single column centemetre, minimum length 2 cm. (Please supply A/W as PMT. Or supply rough setting instructions.)

Conditions: All copy for Classified section must be pre-paid. Cheques and postal orders should arrive at least two weeks before the publication date.

If you wish to discuss your ad, PLEASE RING Diane Davis 01-437 4343.

Here's my classified ad.

(Please write your copy in capital letters on the lines below.)

			Please continue on a separate sheet of paper

I make this ..... words, at ..... per word so I owe you £ .....

Name .....

Address .....

.....

.....

Telephone .....

Please cut out and send this form to: Classified Department, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

48K SPECTRUM KEYDEFINE

Incredible KEYDEFINE gives you 35 extra user-definable FUNCTION KEYS. Define your own keys using the DEFINE option or use with the functions pre-defined.
SINGLE-KEY FUNCTIONS include:

★ TRACE	★ DPOKE
★ RENUMBER	★ DATALINE
★ COMPRESS	★ RESET
★ DPEEK	★ DEC-HEX
★ AUTO LINE	★ PEEKLOOP
★ FREEMEMORY	★ RUNCODE
★ HEX-DEC	★ CROSSHATCH

Any Basic or machine code you can write can be instantly called with a single key press. It will even save itself with your routines. FULL MONEY BACK GUARANTEE if you are not delighted with KEYDEFINE. Immediate despatch by first class return of post. Only £4.95 from:

SCIENTIFIC SOFTWARE
37 COTTESMORE ROAD
HESSLE, N. HUMBERSIDE
TEL: 0482 649187

ZX81 — SPECTRUM

We can now offer out-of-guarantee repairs by our Computer Dept. Our engineers have had over three years' experience servicing Sinclair Computer products. Price including p&p, ZX81 — £11.50; 16K Ram — £9.95; Spectrum — £18.75. Send with cheque or PO. T.V. Service of Cambridge Ltd, French's Road, Cambridge CB4 3NP. Tel: (0223) 311371.

LYNX 48/96K DATABASE

No programming experience needed for operation. Useful in home/club/group or small business.
Features include easy to handle 30/50 record files of 70/112 characters per record.
Ready to use empty file loaded with program, can be simply replaced by appending another file. Menu selection provides for auto-record numbering. Auto-record scroll with pre-entry point. Single record retrieve. Single/block record write/delete with input safety check. Save unfinished work under program control. Save files under own names.
Price £12.95 inc.
Crossed cheques/POs to
LYNX COMPUTING
56 MEADOWFIELD DRIVE
EDINBURGH EH8 7LU

BREAKER BREAKER

for the Commodore 64, makes back-up copies of most popular cassette programs. Protect your software investment. £3.95. C.Kent, 26 Northcape Walk, Corby, Northamptonshire.

★★ TAPE COPIER ★★

You need a BACK-UP copier to protect YOUR Spectrum. Our package copies ALL types of programs easily with many unique features. **MICRODRIVE COMPATABLE**, we are so convinced of the professional quality of our product we offer a **FULL MONEY BACK GUARANTEE** if you are not satisfied.

- ★ LOADS in all program parts (no limit) CONTINUOUSLY — even without pressing a key. Most copiers require many loadings — MASSIVELY saving you time and trouble!
- ★ Copies ALL programs that we are aware of (headerless/mc/etc).
- ★ Break at any time — just copy a "header" if you like!
- ★ First class post + updates at £1.50.
- ★ Verifies. Repeat copies. Abort (change your mind). STOPS programs.
- ★ Maxcopy makes a working copy of the full 16K or 48K! Gives program name.
- ★ FULL user instructions but the package is VERY SIMPLE to use.

Cost £4.50

LERM, DEPT PW
16 STONEPIT DRIVE,
COTTINGHAM
MARKET HARBOROUGH, LEICS.

SPECTRUM SPEEDYLOAD. Halve your waiting time! This short program lets you save/load at 3,000 baud. Easy to use with any tape command. Cassette (48K), £3.95. Ness Micro Systems, 100 Drakies Avenue, Inverness.

SPECTRUM AUTOKOPY 3

Take back-up copies of any Spectrum tape. But do not break copyright or conditions of sale.

NOW MORE POWERFUL THAN EVER

The most advanced copier yet produced. The only copier really capable of copying programs the full 16K or 48K long. Even copies programs recorded from the bottom of Rom to the top of Ram, in one go!
A massive 32K or 64K capability. Copies Basic, machine code, headerless. Auto abort on tape loading error. No protection device too difficult.

Use Autokopy for programs the other copiers will not copy.

Backed up by fast, friendly service. Your earlier versions updated if you return tape together with 50p.

Send £3 only to: B. Tidd, 160 Howlands, Welwyn Garden City, Herts AL7 4RG.

SOFTWARE

BUSINESS SOFTWARE for DRAGON

Business Utility 1, Mailing List, Stock Control, Accounts, Database, Invoicing . . . Large range available from £9.95. SAE for list. Cheques/POs to: B. MISTRY, 75 St Margaret's Road, Bradford BD7 2BY.

VIC20 CHARACTER DESIGNER plus resolution sketcher. Design your own characters with ease. Writes Basic programs, contains data for characters, only £4 for both. For details Tel: 01-310 4031 after 6 pm.

TRY US FOR SOFTWARE
CBM 64/SPECTRUM
UNIQUE BUY-BACK TRADE-IN SYSTEM
THE ONLY WAY TO BUY SOFTWARE
SAE for details. State Computer to Jaycee Software, Freepost (EN84) (no stamps) Forres IV36 0BR.

TELEVISION SERVICE, let your ZX81, Spectrum, take you to exact component, Thorn 1500 chassis, £5. Tester Software, 31 Longsands, St Neots, Cambs PE19 1SS.

DISCOUNTED SOFTWARE for Spectrum, BBC, Commodore 64, Vic20, Dragon, Atari and others. Send SAE for lists. N. P. Cooper, Computer Software, 8 Weldon Close, Church Crookham, Hants, GU13 0BG.

SERVICES

SPECTRUM PROGRAMS REQUIRED by Turtle Software for New Year marketing. Good royalties paid. Everything considered. Send to: Turtle Software, Wynchwood School, Fristock, Oxford OX7 3QJ. SAE for details.

FOR HIRE

TO HIRE A COMPUTER from ZX81 upwards, ring or write to Business and Computer Services, 292 Caledonian Road, London N1 1BA. Tel: 01-607 0157.

EDUCATIONAL SOFTWARE

SPECTRUM EDUCATION. From Jodan Software, Number Eater, Steer Robbie the Robot around the Number Field and Answer his Maths Questions. Animated maths. Practice on the 48K Spectrum. Variable skill levels, suit ages 4+. Send £4.95 to: P. Grove, 68 Dingledery, Olney, Bucks.

EDUCATIONAL SOFTWARE for Spectrum 48K. GCE, O/CSE Physics, six programs, £6.50 or both tapes, £12. Think Tank, Dept. PCW, 35 Wellington Road, Wimbledon Park, London SW19 8EQ.

JIVE SOFTWARE. Two educational maths programs for Spectrum 48K, only £5.75. (1) Dartscore teaches addition, subtraction, multiplication. (2) balance teaches problem solving. They make maths fun. 76A The Hill, Wheathampstead, Herts.

DEALERS

COMMODORE 64 £164
(Excluding VAT)
Disk drives and cassettes also available
Tel: Floyd Patterson; Tel: 01-969 0819
or send SAE
Image Science Micro Computers Ltd
189 Freston Road, London W10 6TH
or cheques/POs (add 15% VAT) and £8 for p&p Securicor delivery
Full after-sales maintenance on all Commodore equipment bought from us

CONTACT ANGLIA COMPUTER CENTRE for the Spectrum 16K plus 48K, Vic20, Dragon, Lynx, Vic and Epson HX-20. Tel: (0603) 667-036. (Unbeatable prices.)

SOFT MACHINE
OPEN MON-SAT, 10.30-6

We offer a selection of the Finest Books and Software currently available for: Oric, ZX81, Spectrum, BBC, Dragon, Vic20 and Commodore 64 Microcomputers.

3 STATION CRESCENT, WESTCOMBE PARK, LONDON SE3.
Tel: 01-305 0521

or send SAE for free Catalogue (State which Computer)

LANCASHIRE MICROS

ACORN/BBC, SINCLAIR, COMMODORE, ORIC, MEMOTECH, DRAGON + LYNX PERSONAL COMPUTERS.

We have a very wide range of software, books and accessories, including over 200 titles for the Spectrum alone.
51 QUEEN STREET, MORECAMBE
Tel: 411435

MAGAZINES

DRAGON USER

To make the most of your Dragon you need **Dragon User** — the independent magazine for Dragon owners. To make sure that you receive a copy of Dragon User regularly subscribe direct to us. A year's subscription costs £8 for 12 issues or subscribe for two years for £14.40 and receive a free copy of either **The Working Dragon** or **Dragon Gamesmaster** (overseas rates available on application). Send a cheque or postal order made payable to Dragon User, and accompanied by your name and address, to Dragon User, Subscriptions Department, Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH.

ACCESSORIES

A MUST FOR MICRO OWNERS

Eliminate loss of Data and Ghosting through static with a permanent ANTISTATIC work area place mat. Size 1 metre x 1.25 metres. **£8.30** inclusive VAT, p&p. Cheques/PO to **DOWERS INTERIORS, 98 Oxford Road, Banbury, Oxon OX16 7QU.** Tel: 0295-52055.

FOR SALE

16K BOXED VIC20, tape deck, manuals, two cartridges and super expander. Beginners Machine Code, joystick plus £105 of tape games. Asking £225. Tel: (04218) 2070.

VIC20 EXPANSION STACK STOREBOARD, 8K, plus Vickit 3, Graphics chip £40. Tel: 01-300 3110. Also Matrix, Startrek, Tombs of Drewan. Very cheap.

COMPUTHINK DOUBLE DRIVES with control board and lead, £350. Dolphin BD80 printer £175, I-EEE 488/RS232 interface unit £100. All for Commodore Pet. Tel: Leicester 673536.

VIC20, cassette deck, 16K, super expander cartridge, joystick and software, £185 ono. Tel: (0442) 60002.

SHARP MZ80A 17 KUMA programs, assorted software, little used, still under guarantee. Original cost over £700, sell for £395. Tel: 0628-34362.

MICRODRIVE AND INTERFACE 1 order forms, any offers considered. Tel: 0452 830675, ask for Dave.

WANTED

SUNSHINE

is seeking authors for new titles to add to its highly original and successful book range. Experienced and first time authors are invited to submit manuscripts, ideas or fields of interest. Full details of what we can offer from **David Lawrence, Book Editor, Sunshine, 12-13 Little Newport Street, London WC2R 3LD.**

Sunshine: Publishers of Popular Computing and Dragon User

CASH UP TO £160 for Atari 810 disc drive and up to £65 for 850 interface. Tel: Chris on Garston 672235.

WANTED

Quality Games and utility programs for any Micro. All programs considered. *Instant cash plus royalties on all programs accepted with a view to distribution in UK, USA and Europe.*
Dream Software PO Box 64
Basingstoke, Hants RG21 2AB
Tel: Basingstoke (0256) 25107

Computer Swap 01-437 4343

Free readers entries to buy or sell a computer. Ring 01-437 4343 and give us the details.

Spectrums for sale

FOR SALE. 16K Spectrum with original box etc, plus six months guarantee and three games, Jet Pac, Spawn of Evil, Planet of Death, £75 ono. Two months old. Unwanted present.

THE BEST SPECTRUM SOFTWARE. Diddums, Arcadia, Pyramid, Chuckie Egg, Zzoom, Atic-Atac, Manic Miner, Tranz-Am, Lunar Jetman, Train Game, Heathrow ATC, Chess Player. All tapes £2.50 each. Tel: (0339) 2757.

48K SPECTRUM and full size DK'Tronics keyboard and fuller programmable sound generator and joystick interface and £70 of software including Fourth VU-file and assembler plus four books and micro drive order form, £200. Tel: Andrew at Orpington 0689 24745.

SPECTRUM GAMES for sale or swap. Black Crystal, Football Manager, Trans-Am, Ant Attack. Tel: 01-907 8964.

SPECTRUM SOFTWARE including Lunar, Jet Man, Circus, Scrabble, Psion and other ultimate games plus Pascal and Forth. Telephone for details, 01-723 9947 after 5 pm. Ask for Peter.

48K SPECTRUM. Mint condition and software including Alchemist, Snowball, Quill and cassette recorder, worth over £300, sell for £200 or swap for Commodore 64 (plus cassette deck). Tel: 01-421 1108, ask for Simon.

Dragons for sale

SWAP £140 worth Dragon software and joysticks for R/C model. Any model considered. Titles include Cuthbert in Jungle, Ugh, Bonka, Danger Ranger, Pettigrews Diary, etc. Tel: Stafford 0889 881475.

DRAGON 32. Boxed as new, with books, leads and manuals, £150 complete, with a few games tapes. Tel: Glastonbury 34035.

DRAGON GRAPHICS CREATOR. Create your own graphics in any "P Mode" and "Screen" and save them to tape, includes demonstration program and detailed instructions, £4.95. 35 Little Gaynes Lane, Upminster, Essex.

DRAGON GAMES, over 30 games to swap: Microdeal, Morrison, Salamander etc, Arcade Adventure Sport. For list write to: Peter Lewis, 32 The Firs, Mold, Clwyd, North Wales.

DRAGON 32 for sale, two new Dragon joysticks, four books, over £105 worth of software. All good condition, worth £357, bargain at £285. Tel: Dorking (0306) 888426 evenings.

AQUARIUS

"GAMES FOR UNEXPANDED MACHINE"

BUNCH OF FIVE CASSETTE (Snake, Masterguess, Symon, Bomber, Hi-Lo) £4.95

CASSETTE RECORDER LEAD..... £1.95

SPECIAL OFFER Order both: get **£1** *off total*

SPECTRUM. Save wear and tear on your power socket with our own RESET SWITCH **£3.95**

PROCESSOR LTD.
A.O.S. House
1 Willow Parade
CRANHAM
Essex RM14 1DZ

SPECTRUM SPECTRASOUND
Audio through your TV
£9.00 + 60p p&p

SAE for further details
MAIL ORDER ONLY

SPECTRUM SOFTWARE FOR SALE. Splat!, Chuckie Egg, Train Game, Transylvanian Tower, 3D Tanx, Frenzy, Mined-out, Centipede, Schizoids, Planetoids, Orbiter, Word Processor, Horace, Skiing, Spiders, Astroblaster, £3 each or swap for other titles.

SPECTRUM SOFTWARE for sale, over 30 titles including Hungry Horace, Cyber Rats, Vu 3D, Micro Primer 2 and 3. Tel: 0244 26906 evenings.

ORIGINAL SPECTRUM SOFTWARE for sale. Ant Attack £4.50, Bugaboo £4.50, Centipede £3.50, 3D Tanx, £3.50. Tel: David, Reading 0734 66140 after 4 pm.

Commodores for sale

COMMODORE C2N cassette unit, £25. Tel: (Reigate) 43905.

VIC SOFTWARE FOR SALE. Switchable Ram pack, Super Expander, Introduction to Basic 2, Chop Lifter, River Rescue and many other cartridges, 12 cassette games worth £230, sell for £150 ono. Tel: (021) 353 1063 after 4 pm.

VIC20 CASSETTE DECK, six months old, joystick, 16K switchboard, Ram pack, manual, over 160 games, utilities, etc. Vic fitted with reset, £225 the lot. Tel: 01-840 3610.

COMMODORE 64 Chap Pack 1, contains six programs (hi-res graphics, etc), £5. Mr Cope, Hall Farm, New Road, Dithorne, Stoke-on-Trent, Staffs.

COMMODORE 64 plus printer-plotter, Simon's Basic and books, £340 ono. Tel: Tonbridge (0732) 361920.

Acorns for sale

BBC Model B games for swap. Lothlorien's Paras and Battlezone 2000, Superior software's Hunchback, Software Invasion's Attack on Alpha Centuri and Gunsmoke. Tel: Canterbury 58529.

BBC B, 32K, 1.2 Rom cassettes deck — list — Rocket Raid, Plantoids Defence, Expert Guide, Assembly language, BBC revealed, 30 programs, still boxed, £380. Tel: 01-892 8768.

BBC MODEL B with disc interface and disc drive, word wise, 1.2 Rom, also disc doctor, £600 or will swap for Apple II with disc drive. Tel: Watford 25995.

BBC MODEL B Romik's Alien Breakin, Atom Smasher and Birds of Prey, unused, £15 the lot. Tel: 04868-4302, after 6 pm.

For sale

SHARP MZ80A 48K with screen, cassette recorder, software, including The Valley, all for £350 or 48K Spectrum and £280 ono. Tel: Douglas (0624) 3626.

VIC20. Swap Pirate Cove for Adventureland, The Count or Voodoo Castle. Tel: 0384 277975.

ORIC 48K COMPLETE including several games, £120 ono or swap for 48K Spectrum. Tel: Doncaster (0302) 49547.

SHARP MZ80 (48K) plus hi-res graphics and lots of programs, £300 ono. Tel: 01-455 9566.

COMPUTERS LYNX 48K, 10 months old, manual, original packaging, user magazines, printer cable and software, £10 games. Software will run serial printer, £180. Tel: 061-432 5868.

TRS80 MODEL 1, level 2 Basic, 48K, expansion interface, one disc drive, lots of software, including Scripsit, Edtasm, Zchess II, Newdos 80 etc, £390 ono. Tel: Eric, 01-947 7477.

INTELLIVISION GAMES CONSUL plus four games, B17 Bomber, Lock and Chase, Spacehawk and Football, still boxed, seven months old. Tel: 01-289 9451.

ZX PRINTER for sale. Excellent condition, only £20. Tel: 061-881 3651 ask for Tony.

SHARP MZ80A software and dust cover, as new, still in original box, £290. Tel: Fleetwood 78252.

SORD M5 with Basic I/G worth £175, four months old, perfect condition, want £125 or 48K Spectrum of same age and condition. Mr D. Simpson, 3 Astley Street, Albert Avenue, Hull.

BMX, star shaped wheels, sell for £70 ono or swap for 16/48K Spectrum or Oric-1, bike cost £110. Buyer collects please! Telephone 664 6177 (031) (Edinburgh) any time.

ORIC-1 16K, as new, plus £40 printer voucher, ultra tape, book, the Oric-1 by Ian Sinclair, worth £114 but unemployment forces quick sale, hence £90. Tel: Lincoln 33464.

ORIC 16K to swap for a Spectrum, bought in August this year, guaranteed, plus software. 01-660 3968.

NEWBRAIN model AD, unused, guaranteed, Chess, other software, cassette unit, £195 + p&p. Tel: 0845 597330.

LYNX 48K computer with two months guarantee left, plus compatible tape recorder, £160. Tel: Luton (Beds) 502944.

TI-994A, under guarantee, boxed, plus all leads, plus £60 software including Connect Four cartridge plus two joysticks, all for £130 or nearest offer. Tel: 0254 672068 after 5 pm. Buyer collects.

LYNX 48K, excellent condition, boxed, under guarantee, also software and magazines for £180 ono. Dorchester area (0929) 462 872.

LYNX 48K, six months old, software included, £125. Offers! Tel: Larkhall 88279.

LYNX SOFTWARE for sale, Gempack 4, Sultan's Maze and Monster Mine, £4 each or £9 for the lot. Tel: (01) 428 1415.

MICRODRIVE order form to highest offer. Tel: 0242 42424.

ATOM 28K Ram, 32K Rom including: F Point, Acornsoft word processor + four utilities all on Rom expander colour board, tapes 3A PSU, all boxed, seeing is believing. Offers. 061 865 5809.

TELETYPE KSR 33, ideal cheap hard copy for experiments, with stand, offers. Tel: Malvern (06845) 68865.

LYNX 48K, as new, boxed, new cassette leads, users magazines with mailing membership and program, The Lynx by Granada. Offers around £170 accepted. Tel: 0705 373357, after 6 pm.

IS THERE ANYONE who would like to exchange ideas and software with a lonely BBC B owner in Belgium? Please write to: Sys Sohan, Heidelaaw 13, 8200 Bruges, Belgium. Return fast.

TEC 10/40 DAISYWHEEL PRINTER, brand new, unused. Also Phoenix monitor (12in), virtually unused. Offers for both. Tel: 0268 285406 (Basildon) evenings or weekends.

COMPUTER SWAP COMPUTER SWAP

Computer Swap entries are limited to 30 words. Either fill in the accompanying form and send it to Computer Swap, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD or telephone 01-437 4343.

All software offered through computer swap must be in original condition and for private sale only.

Warning: It is illegal to advertise pirated software.

Please write your copy in capital letters on the lines below.

Name.....

Address.....

.....

Telephone.....

ORIC HANGMAN — Candy Floss game, Oric games book, get the most out of your Oric book, all three for £6.50 including postage. Notts 793989.

FULLER BOX SOUND SYNTHESISER, sell for £20 or swap for programmable joystick, interface. Tel: 0482 447692.

ORIC 1 48K, cassette, £42 software and one Oric magazine, £200, or swap for CBM 64 and cassette. 218 Sicey Avenue, Shiregreen, Sheffield S50 RP.

RABBIT NIGHT CRAWLER, £3, Moons of Jupiter by Romik, £4. Blitz Craze and Defender (on same tape), £5, or swap for any other software. Tel: 0582 862 900 (Luton).

FULLER MASTER UNIT for Spectrum with sound and speech synthesiser, amplifier, joystick port, three months old, perfect condition, £40. Tel: 051 625 8604.

FED-UP paying £5 for one game? Three excellent games, Force, Town, Snake for £2. Send cheque, PO, payable to: Monksoft Highlands, Blue Boys Park, Minchinhampton, Stroud, Glos GL6 9JT.

MICRODRIVE, Microdrive, Microdrive, Microdrive, Microdrive for sale. One microdrive, unused, still in box (yes you read correctly a microdrive), only £80. Tel: Simon, 061-766 4943.

TI-994A JOYSTICKS, Connect Four, and Beginner's Basic Tutor, all unused, £25. Tel: 061 737 1034.

FOR SALE, computer magazines, Sinclair User, programs and Sinclair User annual, number one, cost £20, will sell for £12, buyer pays postage or collects. Tel: 0453 45515 (evenings).

TI-994A plus Munchman cartridge, plus Hunchback Havoc, plus joysticks, swap for Vic-20, Spectrum or Oric. Tel: 0634 371 205 after 6 pm.

SUPERBASE 64, cost new £99, will accept £60, brand new — for business. Tel: Darnel, 01-703 4153.

SPECTRUM SOFTWARE for sale, one-third original price plus 50p p&p, Chess Flight, Penetrator, Backgammon, Monopoli, Hobbit, Scrabble, Chequered Flag and many others wanted. Protects Sub Hunt. Tel: 0702 617608 after 6 pm.

INTELLIVISION VIDEO GAME, includes Auto Racing, Star Strike and Soccer, mint condition, hardly used, unwanted gift, £75. Tel: 01-561 1079.

FOR SALE PCW magazines, from 16/12/82 to 22/12/83, all good condition, 20p each. Tel: 01-397 2421.

40CH FMCB Sapphire X2000 power mike, Mighty Magnum homebase antenna, power pack, 35ft RG58 coax, for Spectrum 16/48K. Write: Andy Cooper, 267 Braehead Estate, Bon Hill, Alexandria, Dumbartonshire G83 9NE.

SUPER EXPANDER for Vic20, £20 ono. Tel: Brighton (0273) 415778.

WORD PROCESSOR with IBM typewriter. Excellent printout, many functions. Also plain-paper copier, £180. Tel: 01-449 4165.

MICRONET 800 MODER for communications with ZX Spectrum, £65. Tel: 0865 341194.

EPSON 16K PORTABLE with printer and micro cassette. Excellent condition, £375 ono. Tel: 0670 368992.

MULTI-COLOUR SPORT TV GAME. Good as new, fully boxed, £13; Casio musical calculator, fully boxed, £5 or £15 for both. Tel: Billingham 551049 after 4 pm. Ask for Peter.

MATTEL INTELLIVISION UNIT plus seven cartridges, £110 ono. Tel: Lancing 755416.

VALHALLA, Lunar Jetman, Oracles Cave, Hunchy, Castle, Pheenix, Haunted Hedges, Cyrus, Chequered Flag, Games Designer, Luna Crabs, etc. Over 30. Tel: 061-881 3651, ask for Tony.

Wanted

WANTED. AIM 65 Microcomputer, manufactured by Rockwell, any reasonable price considered. Tel: Horley (02934) 5132 (anytime).

WANTED: cassette recorder for Commodore, also Ram unit for Vic20. Tel: Bexhill (0424) 224867.

IMAGIC cartridge for Intellivision games system. Dracula, Ice Trek, Atlantis, Tropical Trouble. Brand new, unwanted, £16 each. Tel: 01-764 4075, after 6 pm.

DRAGON 32, swap Ultimate Adventure for Bonka or Frogger. Tel: 01-427 2849.

SWAP 48K Oric for 16K Sinclair Spectrum or ZX81 plus software. Tel: Leeds 462210, daytime.

ESPIONAGE ISLAND program for 48K Spectrum, swap for any other 48K programs. Tel: Droitwich 770621.

SWAP Commodore 64, cassette deck and games, for BBC micro. Tel: 736 3898 and ask for Byron.

WANTED: 64K, 16K Ram pack for ZX81 48K, Spectrum 3 Series, surplus/unwanted add-ons, software, compiler, assembler, disassembler for both machines. Tony, 01-659 5083. 31 Melbourne Court, Anerley Road, London SE20 8AR.

WANTED. Spectrum 16K/48K, will pay reasonable price, if possible software wanted. Selling Grandstand Astro Wars, not in top condition, but it's very cheap, £6 and BBC, 50 games, £6 plus Vampire. Tel: (01) 701 9485.

SWAP your 16K Ram pack for Vic20 for my Pulsonic disco lights. Tel: Woodford 5058989, ask for Robert.

WANTED. ZX Printer, must be in excellent condition. Write to Nick Venitt, 181 High Street, Street, Somerset BA16 0NE.

MISERABLE VIC-20 COMPUTER seeks Commodore's "Voodoo Castle" and "The Count" adventures, also Sumlock's "Scramble" and Rabbit's "Escape MCP." (Quick). Tel: 0558 822509 (after 5 pm).

WANTED. C2N cassette recorder for Vic20, £15 offered, must be tip-top condition. Tel: Ron Morris 0639 813206.

WANTED. BBC B OS1.2 computer in good condition. Phone Drotwich 0905 779256.

48K SPECTRUM and tape recorder. Tel: Manchester 061-445 6630.

SWAP VIC20 for Spectrum software. Manchester 061-445 6630.

WANTED. Printer for Vic20. Tel: 01-656 7122 anytime.

WANTED. BBC computer. Tel: 0608 2373.

WANTED SOFTWARE for the Vic20. Swap any games or will pay cash. Tel: 01-958 8643, Andy.

WANTED. Colecovision Turbo Module, also Zxxon cartridge. No offers refused. Tel: 04862 70318 after 4 pm.

WANTED. 300 band Modem, driving software for the Spectrum. Steve Gold, 9 Watt Lane, Sheffield. Tel: Sheffield 666867.

HOBBITT plus 3D Tunnel and Escape for the Spectrum. All together in exchange for Valhalla 48K. Write to: E. Jones, 65 Queen Mary's Road, Foles Hill, Coventry CV6 5LN.

SPECTRUM SOFTWARE SWAP. Trader Trilogy (boxed), and Ship of the Line, both 48K for Valhalla or any one for Apocalypse, Go to Jail, or any adventure tape. Tel: Jeff, Birmingham 779 3026.

WANTED. Any hardware, plus software for Aquarius computer plus anyone willing to start an Aquarius owners' club. Contact Jim Colville, 157 Croftside Avenue, Glasgow G44 5NG. Tel: (041) 631 2208.

SWAP COMMODORE 64 for BBC Micro or sell for £170. Tel: 736 3898 and ask for Byron.

16K RAM PACK for ZX81 wanted. Tel: 0706 621382.

CRAZY KONG for unexpanded Vic20, £4.50 or swap. Tel: Ian, Barnsley 762710.

KEMPSTON JOYSTICK INTERFACE, Spectrum Handbook, Vu-file, Arcadia, Dragon Mountain, Dragon Personal Finance, Dragon 32 How to Make the Most of It, eight Dragon games in one. Swap for anything. Vic20 or offers? Write: Mr M. O'Donnell, 5 Worthington Close, Runcorn, Cheshire.

WANTED. Spectrum motherboard, also ZX printer (cheap). Tel: Worthing 35298.

SPECTRUM SOFTWARE COLLECTOR will purchase makers' originals with cassette slips, large quantities purchased for cash. Will collect in London area. For full details and price telephone 01-520 0904.

WANTED. CBM 64 software. Top prices paid. Originals only. Send SAE and list to: Upper Shortlands, Wedmore, Somerset.

SWAP ROM CARTRIDGE. Parsec and Music Maker for Personal Record Keeping or Adventure Pirate and two additional adventures. Tel: Sutton 643 2310.

CBM 64 DISK USER to swap programs. Tel: Micky, 01-828 2333, extension 249, daytime.

DRAGON 32 SOFTWARE to exchange over 40 programs from Microdeal, Dragon, Data, etc. Send SAE for list and details. T. Mohsan, 24 Irving Place, Blackburn, Lancs, BB2 6LR.

ZX80. I will pay £15 for a working ZX80, any memory size. Tel: 01-874 5136, ask for Ian or 0787 472968.

WANTED. Casio FX602P, offers to Mr R. Haydon, 21 Manchester Mansions, London N19 3SW.

STANDARD COMMODORE JOYSTICK. Swap for any Spectrum software or sell for £5. Tel: Telford 603 351.

SHARP DISC DRIVE WANTED plus Interface box for Sharp MZ 80K computer. Tel: Harrogate 0423 62755.

DRAGON 32 demonstration cartridge wanted or any faulty or defect cartridge. Tel: Staines 58707 after 6 pm.

SWAP OR SELL TRS80, 16K plus manual and tape plus £70 of software. Excellent condition, £200. Or swap for 48K Spectrum or Vic64. Tel: Wrexham 352052 evenings.

WANTED. Spectrum 16K model 2, £70. Tel: Basildon 555468.

WANTED. Cheap 4K Rom ZX80. Tel: Pakenham 30618.

WANTED: 3K Jupiter Ace with accessories, or Mattel Aquarius with accessories, willing to pay £30 to £40. Must be in working order.

SPECTRUM programmable joystick interface wanted. Also wanted: Kempston or Spectravision joystick, good condition required, good price paid. Tel or write to: Stephen Duckett, Upper Shortlands, Wedmore, Somerset. Tel: 712564.

WANTED. BBC B micro in good condition. Tel: E. Record on 01-894 2982.

BRAND NEW BMX BIKE, in box, 20in, unwanted gift. Swap for Spectrum 48K. Tel: 01-207 2815. evenings.

SPECTRUM SOFTWARE TO SWAP (originals). Jet Pac, The Orb, Star Trek, City Bomber, Night Flight, Wanted Assembler, Zeus Assembler plus Monitor/Disassembler. Tel: Graham 0293 (Crawley) 541988.

WANTED BADLY. DK'Tronics light pen for 48K Spectrum, will swap Lunar Jetman, Android 1, 3D Tanx, 3D Tunnel and Timegate, in exchange. Tel: Graham, Wakefield 252046 after 6 pm.

SWAP MY TI99 4A plus software and two joysticks for another computer, anything apart from ZX81 or Jupiter Ace. Mostly anything considered. Tel: Hornchurch 57487.

SWAP. Videomaster Chess, Champion Computer, good condition, boxed, plus Hobbit and Scrabble for Sinclair printer or other Spectrum hardware. Details to: Jenkins, 65 Westfield Road, Barton-on-Humber, South Humberside DN18 5AA.

SPECTRUM SOFTWARE to swap. Over 100 titles. Tel: Nottingham (0602) 201193, ask for William or send SAE with lists to: 5 Cohen Close, Arnold, Nottingham NG5 6RL.

WANTED for 16K ZX81, 3D Grand Prix (DK'Tronics), Invaders (hi-res) (Odyssey), Ocean Trader (Q'Silva), Froggy (DJL). Tel: Robert on Southwell 812782 after 4.15 pm. May sell flight simulator if required.

SWAP 325 American "Marvel" comics (mainly collectors' items and No. 1s), for CBM64 or 1541 disc drive. Tel: 01-673 5819 after 6 pm. (Will not sell individual issues.)

WANTED. Joystick and Interface for Spectrum, secondhand. Offers considered. Tel: 01-886 2931, ask for Vince.

COMMODORE 64 SOFTWARE, will swap or sell. Painter, Othello, Mr Do, £15 or will split. N. Wareing, 13 Sunningdale Road, Penton Manchester M34 1QP.

SWAP. Vic20 Adventureland cartridge for Tomb of Drewan cassette or sell for £8. Tel: (0632) 568194.

DRAGON 32. Swap five as-new cassette programs for your hi-res or chess cartridge, choose from Gridrunner Quest, Android Attack, Katerpilla Attack, Computachoice, Dragon Mountain, Planet Invasion. I. Bean, 3 Birchwood Avenue, Middlesbrough, Cleveland.

VIC20 SOFTWARE to swap Chess, Arcadia, Abductors, etc. Will swap for other games, also 3K expansion wanted. Write or apply in person to Eddie, 59 Wigmores, Woodside, Telford, Shropshire.

WANTED. Commodore C2N cassette and any daisywheel printer. Tel: 01-360 2156 evenings and weekends only.

COMMODORE 64 software wanted. I also want the very latest BBC "B" games and Beeb compatible "Quickshot" joystick. Tel: St Annes (0253) 727676 and ask for Tim.

SWAP MY THREE-MONTH-OLD DRAGON and software with £50 cash for your CBM64 and tapedeck. 7 Swift Avenue, Manby, Louth, Lincolnshire LN11 8TZ. Tel: 05[illegible]. (Tapedeck preferably wit..

DRAGON 32. Good condition. ... five tapes, two joysticks, swap for Issue 2 48K Spectrum with software or sell for £140 ono. Tel: Luton 453526 after 6.30 pm.

SPECTRUM SOFTWARE SWAP. Sheer Panic, Rescue, Jumping Jack, Arcadia and many more. Tel: 01-789 5728 after 5 pm.

SINCLAIR PRINTER will pay £20 payment through postal international money order. Write Boursaux 9 Rue M. Regnier 75015, Paris, France or Tel: 33.1. 6873582.

WANTED. Centronics printer. 737/1 or 737/2 in good order. Manchester area preferred. Tel: 061-439 4841 with details and price.

SWAP GORF for any Scott Adams adventure cartridge for Vic20. Tel: 0254 35117 after 5.30 pm.

SWAP my unused Backgammon computer for a ZX printer. Must be in fair condition or any other Spectrum hardware considered. All replies answered. Eddie Eharley, 65 Anner Road, Dublin 8, Ireland.

SUNSHINE

Mastercode Assembler

for the Commodore 64

Full Commodore 64 Assembler/Disassembler

£14.95 inc VAT

Mastercode is a substantial and complex program of use to anyone interested in writing machine code on the Commodore 64. Its features include:

- ☐ Machinecode monitor
- ☐ File Editor
- ☐ Disassembler
- ☐ Assembler

Mastercode is a full two pass assembler. It accepts labels, variables and equations within assembly language programs. It is possible to store programs anywhere in memory, even in parts occupied by the Assembler. Programs can be saved to either tape or disc.

The Machine Code Monitor includes:

■ OUTPUT OF MEMORY TO SCREEN OR PRINTER ■ MODIFICATION OF MEMORY ■ EXECUTION OF MACHINE CODE PROGRAMS ■ SAVING OF MACHINE CODE FILES ON TO TAPE OR DISC ■ LOADING OF MACHINE CODE FILES FROM TAPE OR DISC ■ STEP BY STEP TRACING OF THE EXECUTION OF A MACHINE CODE PROGRAM, INCLUDING DISPLAY OF REGISTER CONTENTS.

The Disassembler will translate into assembly language the contents of any area of memory, whether the 64's ROM or a user program. Output may be sent either to the screen or a printer.

The File Editor includes:

■ ENTRY OF NUMBERED LINES OF ASSEMBLY LANGUAGE INSTRUCTIONS ■ LISTING, INDIVIDUALLY OR IN BLOCKS, OF PREVIOUSLY ENTERED LINES ■ DELETION, INDIVIDUALLY OR IN BLOCKS, OF EXISTING LINES ■ RENUMBERING OF EXISTING LINES ■ SAVING OF ASSEMBLY LANGUAGE FILES TO TAPE OR DISC ■ LOADING OF ASSEMBLY LANGUAGE FILES FROM TAPE OR DISC ■ ADDITION OF A BLOCK OF MEMORY SPECIFIED BY THE USER TO THE USER'S ASSEMBLY PROGRAM

The Assembler allows the translation of assembly language programs into machine code with full error checking, labelling and a range of assembler directives.

LOOK OUT FOR THE SUNSHINE RANGE IN W.H. SMITH'S, BOOTS, JOHN MENZIES, OTHER LEADING RETAIL CHAINS AND THROUGH OUR NATIONAL NETWORK OF BOOK SHOPS AND SPECIALIST STORES.

Please send me Commodore 64 Mastercode Assembler @ £14.95 inc VAT. I enclose cheque/postal order for £ made payable to Sunshine: 12/13 Little Newport Street, London WC2R 3LD. Or telephone your order through Access/Mastercard on 01-437 4343

Name_____

Address _____

_____

_____

Signature _____

SMALL DOT

3D Seiddab Attack is one of the most impressive 3D programs I've seen yet on the Spectrum and there are quite a few of them.

In this you are behind the wheel of a Drone — a super modern tank patrolling the city streets. This involves watching your radar screen for the appearance of the small dot that denotes the presence of a Seiddab — chase it until it comes into view and then, well, you can guess, can't you?

If you succeed in clearing the first screen, you are then transported to the countryside outside the city where you make a much easier target for the unpleasant machines.

The screen display is great, showing the front of your tank as you move it round the city streets, and the radar and range-finder displays for locating the enemy — it's very well done.

Program *3D Seiddab Attack*
Price *£5.95*
Micro *Spectrum 48K*
Supplier *Hewson Consultants*
60A St Mary's Street
Wallingford
Oxon OX10 0EL

EVIL WITCH

Epic is a new software house catering for those BBC owners who want to test their intellectual mettle on the kind of vast text adventures more commonly associated with mainframes and, more recently, the Spectrum computers.

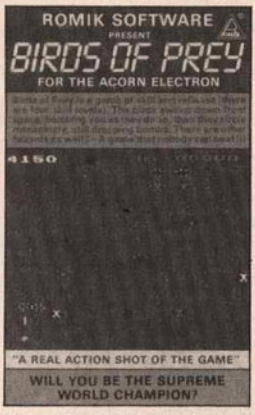
The company currently has three 32K adventures available: *Castle Frankenstein*, *The Quest for the Holy Grail* and *The Kingdom of Klein*.

In the last of these, your quest is to return the stolen magic Klein Bottle — anyone foolish enough to attempt to recover it has been promised hideous retribution from an evil witch.

Can you defy the curse and solve the mystical properties of the five solids (whatever that means) in order to kill the witch? All the games in the series have around 230 locations and are machine coded for fast response times.

Program *The Kingdom of Klein*
Price *£8.45*
Micro *BBC (32K)*
Supplier *Epic Software*
10 Gladstone Street
Kibworth Beauchamp
Leicester LE8 0HL

KAMIKAZE



Now for the Electron comes *Birds of Prey*, a version of *Phoenix* that retains most of the features of the original.

True to Alfred Hitchcock's awesome predictions, the birds have gone on the offensive (and in space at that). They are attacking your (here's a post-Christmas puzzle for you — fill in the missing letters) *lo-e l-s-r b--e*, which is all that stands between the birds and something very nasty indeed.

The birds first of all attack in formation, when they are relatively easy to shoot. But later birds attempt kamikaze runs directly on your base which you will find difficult to avoid. A good implementation of one of the classic arcade games.

Program *Birds of Prey*
Price *£6.99*
Micro *Electron*
Supplier *Romik Software*
272 Argyll Avenue
Slough
Berks

RED ARMY

Wilfred the Hairy, Olaf the Hungry is the surprising title of a strategy game in which you try to take over the world. Well, you have to start somewhere.

Wilfred and Olaf are represented respectively by blue and red armies which are moved by cursor keys. You must fight battles, making sure that you are well supplied with ammunition — should you run out, you'll have to return to your home castle.

The computer plays for the red army and is equally concerned with maximising its territory without overstretching its resources. Microbyte, who manufactures the game is stressing its tactical elements — don't expect any easy victories.

Program *Wilfred the Hairy, Olaf the Hungry*
Price *£5.95*
Micro *Spectrum*
Supplier *Microbyte*
19 Worcester Close
Lichfield
Staffordshire

CAMELS REVENGE

Maintaining some sort of dromedary karmic balance, Jeff Minter, llama-obsessed mastermind behind Llamasoft, has decided to issue *Revenge of the Mutant Camels*, a follow up to *Attack of the Mutant Camels*.

I will not attempt to paraphrase the cassette blurb which explains the history of the mysterious camels and the events of the game, suffice to say that it is very funny and I am pleased to announce that now the camels are on our side.

Using the joystick, you must pit your camel against some of the most bizarre adversaries ever seen in an arcade game, including goats, kangaroos on skis and telephone boxes. The graphics are superb.

As a final point of interest, the game incorporates a new loading system which will function on good quality tape systems and load the game in under two minutes instead of the usual 15 minutes.

Program *Revenge of the Mutant Camels*
Price *£7.50*
Micro *CBM 64*
Supplier *Llamasoft Software*
49 Mount Pleasant
Tadley
Herts

IN KEY

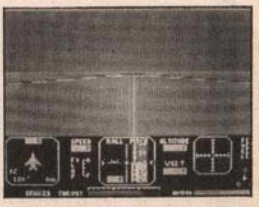
Dancing Feats is another music program for the Commodore 64 — given the computer's music making capabilities, it hardly comes as much of a surprise there are so many.

This looks to be one of the simplest to use — the only thing you have to master is the joystick which you use to play the notes. The computer will keep you in key and the fire button lets you change the octave.

Aside from this, you can choose the kind of bass effect you want and other features like style and tempo. Finally, you can record and playback your masterpieces.

Program *Dancing Feats*
Price *£5.95*
Micro *Commodore 64*
Supplier *Artic Computing*
Main Street
Brandesburton
Driffield YO25 8RL

AIR COMBAT



Digital Integration are not backward in coming forward — the blurb for *Fighter Pilot* contains a long list of reasons why its *Flight Simulation* for the Spectrum is better than

that other well known *Flight Simulation* — the one by Psion.

Pretty convincing the claims are too, backed up by some screen photographs showing the runway approach. In this simulation you are piloting a jet fighter and can practice landing, take off, combat, air to air combat, etc.

With all simulations, you need to spend a lot of time before a sound judgement can be made, but I think this one really does live up to its claims — the 3D views of the runway approach in particular are most impressive.

Program *Fighter Pilot*
Price *£7.95*
Micro *Spectrum 48K*
Supplier *Digital Integration*
22 Ash Church Road
Ash
Aldershot
Hants GU12 6LX

BBC SPRITES

The BBC has wonderful graphics but it does not have sprites — those extremely useful objects that enable you to create convincing and smooth movement.

The *Sprite Master* gives you the facility to create multi-coloured sprites on your BBC which can be moved anywhere on the screen. Up to 32 may be used simultaneously.

Each sprite can be assigned one of 16 characters and you can use any of the graphics modes. Each one is 100 graphic points square, although it is easy to create a smaller shape simply by leaving edges blank.

The program comes with some demonstration programs and relatively simple instructions.

Program *Sprite Master*
Price *£9.95*
Micro *BBC B*
Supplier *Micro Dealer UK*
3 Station Crescent
Westcombe Park
Blackheath
London SE3

SCORECARD

Junior Wordsplits is one of Sulis Software's educational packages for the BBC B.

The program is aimed at the 8 to 11-year-old age group and it is all to do with recognising words in order to spell them properly.

The computer has a vocabulary of more than 500 words and the words appear in a different way and in a different order each time. The program comes with a scorecard so you can keep track of your child's progress.

Program *Junior Word Splits*
Price *£9.95*
Micro *BBC B*
Supplier *Sulis Software*
Baffins Lane
Chichester
Sussex PO19 1UD

BUSINESS RECORD

As soon as the Microdrive becomes reliable, there are going to be a lot of small businesses finding uses for their Spectrums which they never suspected.

Transform has versions of *Purchase Day Book* and *Sales Day Book* on the B side of the cassettes which you can save to Microdrive.

The programs themselves are concerned with the day-to-day running of a shop or other business, keeping records of cheque payments with *Purchase Book* and keeping track of invoices with *Sales Day Book*.

Both programs come with instructions on their use and information can be printed out to both ZX and full size printers.

Program *Sales/Purchase Day Book*
Price *£10.75 (each)*
Micro *Spectrum*
Supplier *Transform*
41 Keats House
Porchester
Mead
Beckenham
Kent

BOVVER TEDS

More disillusionment in the bear department I'm afraid — some of you may remember my horror when I discovered that in *Teddy*, by Supersoft, bears ate snakes. Now they are getting violent.

Bear Bovver is the latest game from Artic and it depicts bovver bears — brusque nasty fellows who chase you all over a maze of ladders as you try to get at some batteries for your car (it conks out every few yards without a new one).

The bears are beautifully done, using large animated sprite effects as they climb up and down the maze of ladders trying to prevent you from getting to your batteries. One of the best yet from Artic.

Program *Bear Bovver*
Price *£5.95*
Micro *Spectrum*
Supplier *Artic Computing*
Main Street
Brandesburton
Driffield YO25 8RL

ROGER 1

Ever fancied sitting in the control tower saying things like "Roger 2 Victor Zero vector on two three seven"? No, neither have I.

But, you might change your mind should you buy *Air Traffic Control* by Microdeal — a program available for both Dragon 32 and BBC.

You must take charge of a number of RPVs (Remotely Piloted Vehicles) and ensure that they don't crash whilst you guide each one to a safe and secure landing.

There are various graphic displays showing the position of the various aircraft and the runway when you are attempting a landing. The program also allows you to take off and perform various other manoeuvres.

Program *Air Traffic Control*
Price *£8*
Micro *Dragon 32/BBC*
Supplier *Microdeal*
41 Truro Road
St Austell
Cornwall PL25 5JE

TEE OFF

Golf simulations abound, but *Royal Birkdale* is the first I've seen to be based on an actual golf course — the game even has the approval of the club.

The author created the program from an actual plan of the course. Unlike some of the early golf game efforts, this seems to have benefited from the need for ever better graphics with the advent of the likes of Ultimate — consequently, when you tee off you actually see a little man swinging his club.

It has all the usual features of computer golf — you choose the club, taking into account wind speed and direction, and the computer keeps score.

Program *Royal Birkdale*
Price *£6.90*
Micro *Spectrum*
Supplier *Ocean Software*
Ralli Building
Stanley Street
Manchester M3 5FD

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

Top 10

BBC*

1	(1)	White Knight Mk 2	(BBC)
2	(—)	Hunchback	(Superior)
3	(—)	Felix and the Fruit Monsters	(Program Power)
4	(—)	Dr Who — The First Adventure	(BBC)
5	(—)	Canyon	(BBC)
6	(—)	Bandits at 3 O'clock	(Program Power)
7	(5)	Killer Gorilla	(Program Power)
8	(—)	Danger UXB	(Program Power)
9	(—)	Felix in the Factory	(Program Power)
10	(—)	Chess	(Acornsoft)

*All Model B only.
(Figures compiled by Micro Management, Ipswich 0473 59181)

Spectrum

1	(1)	Atic Atac	(Ultimate)*
2	(2)	Lunar Jetman	(Ultimate)*
3	(3)	Ant Attack	(Quicksilva)*
4	(—)	Jet Pac	(Ultimate)
5	(—)	The Pyramid	(Fantasy)*
6	(—)	Kong	(Ocean)*
7	(6)	Death Chase	(Micromega)
8	(10)	Chequered Flag	(Psion)*
9	(4)	Manic Miner	(Bug-Byte)*
10	(—)	Pool	(CDS)

*Requires 48K.
(Figures compiled by W H Smith, London)

Atari

1	(1)	Zaxxon	(Datasoft)
2	(—)	Zork III	(Infocom)‡
3	(5)	Enchanter	(Infocom)†
4	(8)	Preppie	(Adventure International)
5	(—)	Escape From Pulsar 7	(Channel 8)
6	(9)	Firefleet	(English)†
7	(—)	Grid Runner	(Llamasoft)
8	(—)	Spy's Demise	(Penguin)¶
9	(—)	Savage Pond	(Starcade)
10	(—)	Zork II	(Infocom)‡

†32K cassette. ¶16K disc. ‡32K disc.
(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Top 10

ZX81*

1	(7)	Defender	(Quicksilva)
2	(2)	Invaders	(Quicksilva)
3	(—)	Football Manager	(Addictive Games)
4	(3)	Chess	(Psion)
5	(—)	QS Scramble	(Quicksilva)
6	(—)	Asteroids	(Quicksilva)
7	(6)	Mother Ship	(Softsync)
8	(—)	Space Raiders	(Psion)
9	(—)	Inca Curse	(Artic)
10	(—)	Crazy Kong	(PSS)

*All 16K (Figures compiled by Boots/Websters)

Dragon

1	(2)	Cuthbert in the Mines	(Microdeal)
2	(—)	The King	(Microdeal)
3	(—)	Champions	(Peaksoft)
4	(3)	Cuthbert goes Walkabout	(Microdeal)
5	(—)	Pettigrew's Diary	(Shards)
6	(8)	Dragonfly 2	(Hewson)
7	(—)	Mined Out	(Quicksilva)
8	(—)	Dragon Trek	(Wintersoft)
9	(1)	Frogger	(Microdeal)
10	(—)	Grid Runner	(Salamander)

(Figures compiled by Boots/Websters)

Commodore 64

1	(6)	Frogger	(Interceptor Micros)
2	(10)	Arcadia 64	(Imagine)
3	(—)	Sprite Man	(Interceptor Micros)
4	(1)	Hovver Bovver	(Llamasoft)
5	(7)	Motor Mania	(Audiogenic)
6	(—)	Krazy Kong	(Interceptor Micros)
7	(—)	Quick-thinking	(Mirrorsoft)
8	(3)	Grid Runner 64	(Llamasoft)
9	(—)	Hungry Horace	(Melbourne House)
10	(—)	Purple Turtles	(Quicksilva)

(Figures compiled by Boots/Websters)

Vic20

1	(—)	Jetpac	(Ultimate)
2	(2)	Catcha Snatcha	(Imagine)
3	(3)	Arcadia	(Imagine)
4	(4)	Wacky Waiters	(Imagine)
5	(1)	Grid Runner	(Llamasoft)
6	(7)	Sky Hawk	(Quicksilva)
7	(—)	Amok	(Audiogenic)
8	(—)	Cactus	(Audiogenic)
9	(—)	Bonzo	(Audiogenic)
10	(—)	Krazy Kong	(Interceptor Micros)

(Figures compiled by Boots/Websters)

Books

1	(1)	Advanced User Guide for the BBC Micro, *Bray*	(Cambridge Micro Centre)
2	(6)	BBC Micro Book, Basic, Sound and Graphics, *McGreggor and Watt*	(Addison-Wesley)
3	(—)	30-hour Basic, Spectrum edition, *Prigmore*	(BBC/NEC)
4	(2)	Spectrum Microdrive Book, *Logan*	(Melbourne House)
5	(10)	Advanced Graphics for the ZX Spectrum, *Angell and Jones*	(Macmillan)
6	(4)	Graphics on the BBC Micro, *Cryer*	(Prentice-Hall)
7	(—)	Using the 64, *Gerrard*	(Duckworth)
8	(9)	Programming the Z80, *Zaks*	(Sybex)
9	(—)	Anatomy of the Dragon, *James*	(Sigma)
10	(—)	Using BBC Basic, *Cockerell*	(John Wiley)

(Figures compiled by Watford Technical Books, Watford 0923 23324 Prestel 28844)
(Last week's position in brackets)

Book Ends

CONVERSION

Maths + Computers = Fun is the sort of title guaranteed to bring on a bad case of nausea — it's a computer book that shows some mathematical uses for your computer, particularly tied to school work.

In fact, it looks a useful book, collecting as it does, all the useful routines for decimal conversion, percentages, fractions, etc, you could ever need under one cover.

Book *Maths + Computers = Fun*
Price *£6.25*
Micro *General*
Supplier *John Wiley & Sons, Baffins Lane, Chichester, West Sussex, England PO19 1UD*

ANALYSIS

Take off with the Electron and BBC Micro is a book that makes use of the fact that both micros run the same Basic; the only difference being that one of the machines runs the Basic at about twice the speed.

The book contains a number of moderately useful programs none of which really rely on speed for their effects. More importantly, in the long run, all the programs are quite well documented with a line-by-line analysis.

Book *Take off with the Electron and BBC Micro*
Price *£5.95*
Micro *BBC/Electron*
Supplier *Granada Publishing, 8 Grafton Street, London W1X 3LA*

ROBOTIC

DIY Robotics and Sensors is a book intended for the BBC computer that could be of general interest.

It deals with the ideas behind peripherals, analogue and digital, input and output and so on. Using this knowledge, you are shown, through simple circuit diagrams, how to construct things like a simple robot eye and a stepper motor suitable for things like buggies and robots.

For the BBC owner there are a number of Basic and Assembler listings to help put these ideas into operation.

Book *DIY Robotics and Sensors*
Price *£6.95*
Micro *BBC/General*
Supplier *Sunshine Books, 12-13 Little Newport Street, London WC2R 3LD*

This Week

Program	*Type*	*Micro*	*Price*	*Supplier*
3D Battle Star	Arc	Oric 1	**£6.50**	Topaz
Action 6	Arc	Oric 1	**£5.00**	Touchstone
Arcadia 64	Arc	Commodore 64	**£5.50**	Imagine
Bimbo	Arc	Spectrum	**£5.95**	Salamander
Blowtorch Blaster	Arc	Oric	**£5.95**	Touchstone
Bombastic	Arc	Atari	**£9.95**	English
Challenger	Arc	BBC B	**£7.96**	Terminal
Character Designer	Ut	Commodore 64	**£5.00**	C P White
Contract Bridge	S	Oric 1	**£5.00**	Touchstone
Danger Ranger	Arc	Dragon 32	**£8.00**	Microdeal
Delta 4	Arc	Oric 1	**£8.95**	Nectarine
Devil Assault	Arc	Dragon 32	**£8.00**	Microdeal
Dragon Hawk	Arc	Dragon 32	**£8.00**	Microdeal
Ed''on	Arc	Aquarius	**£5.95**	Add On
Editext	Ut	Dragon 32	**£12.95**	Nectarine
Eight Ball	Arc	Dragon 32	**£8.00**	Microdeal
Empire	S	BBC B	**£6.95**	Shards
Filemaster	Ut	Dragon 32	**£8.00**	Microdeal
Fishy Business	Ad	Dragon	**£7.95**	Salamander
Galaxy 5	Arc	Oric	**£6.95**	Durell
Genplot	Ut	Spectrum	**£6.00**	K C Teng
Giant Slalom	Arc	Atari	**£7.50**	Artworx
Glaxxons	Arc	Dragon 32	**£8.00**	Microdeal
Graphics System	Ut	Electron	**£9.95**	Salamander
Graphs	Ut	BBC	**£9.95**	Salamander
Hooked	Arc	Dragon 32	**£5.57**	Shards
Hunter	Arc	Commodore 64	**£7.95**	Terminal
Jericho Road	Arc	Spectrum	**£5.75**	Shards
JetPac	Arc	Vic20	**£5.50**	Ultimate
Laser Zone	Arc	Dragon	**£7.95**	Salamander
Leggit	Arc	Atari	**£5.50**	Imagine
Light Cycles	Arc	BBC B	**£6.95**	Pean
Loki	Arc	Oric	**£6.45**	Joe The Lion
Lost in Space	Ad	BBC/Oric	**£9.95**	Salamander
Monster Maths	Ut	Dragon 32	**£6.95**	Shards
N'Vaders	Arc	Aquarius	**£5.95**	Add On
Neptune's Daughter	Arc	Commodore 64	**£9.95**	English
Photo Finish	S	Dragon 32	**£6.95**	Peaksoft
Phrogger	Arc	Aquarius	**£5.95**	Add On
Pinball	Arc	Dragon 32	**£8.00**	Microdeal
Rainbow Writer	Ut	Dragon 32	**£8.00**	Microdeal
Scan	Arc	BBC B	**£6.95**	Pean
Science 1	Ed	Dragon 32	**£6.95**	Shards
Screen Play	Ut	BBC B	**£4.99**	Compusoft
Skramble	Arc	Dragon 32	**£8.00**	Microdeal
Space Fighter	Arc	Dragon 32	**£8.00**	Microdeal
Space Raiders	Arc	Dragon 32	**£8.00**	Microdeal
Space Shuttle	S	Spectrum	**£8.00**	Microdeal
Stellar Dodger	Arc	Commodore 64	**£7.95**	Terminal
Super Toolkit	Ut	Spectrum	**£9.95**	Nectarine
Teleforth	Ut	Dragon 32	**£8.00**	Microdeal
The Guardian	Arc	Spectrum	**£5.95**	PSS
The Pits	Ad	Oric 1	**£5.00**	Touchstone
Vectors	Ut	BBC	**£9.95**	Salamander
Vic Money Manager	Ut	Vic20	**£9.99**	Commodore
Wizard Box	Ed	Spectrum	**£6.95**	Scisoft

Key: **Ad** — adventure/**Arc** — arcade/**Ed** — education/**S** — strategy-simulation/**Ut** — utility

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to: This Week, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

Ziggurat

Kettle of fish

In this final part of this particular stint on Ziggurat, I want to briefly examine a couple of more obscure languages.

Smalltalk enjoyed a brief period of fame when the Apple Lisa was introduced. Many people get confused between the Smalltalk programming environment, as implemented on the Xerox Star, and the language itself. The environment is obviously pretty useful.

However, the language itself, without getting too deeply involved, is a very odd kettle of trout. As I understand it, Smalltalk stores everything in the same way: the symbol for the thing, the operations that may be carried out on the thing and so on. Thus, numbers are stored in this way, and may be added, subtracted, etc. So are the symbols for addition, multiplication and division, etc.

The designers have tried to make the language as uniform as possible. Thus, there are very few concepts to learn for Smalltalk because the same concepts apply to everything. The end result is undoubtably elegant, but it suffers from not taking our intuition into account. Everyone who reaches an advanced state in programming knows the difference between operators, functions and statements, and does not need the process 'simplified'.

I am not implying that Smalltalk is hopeless, just that it is near the start of a road towards a genuinely useful new concept in languages.

Probably the single most important language not yet mentioned is assembly language. A modern assembler, such as Macro-86 on the 8088/6, comes very close to being a high-level language. I particularly like the rich variety of addressing modes available in assembly languages — even the humble 6502 has some extremely powerful, if under-implemented modes. Many of these modes can be realised through the use of indirection operators. Many readers will be familiar with the $, ! and ? of BBC Basic, but this is only the beginning. I should like to see another operator that implements stacks. I propose stacks be defined with a line like:

```
VAR BLOCKS STACK 500 INTEGER;
```

This could define a stack that holds up to 500 integers. A symbol could then be used to push and pop numbers as follows:

```
]BLOCKS=23
PRINT [BLOCKS
```

A right-hand square bracket puts a number on to the stack and a left-hand one removes the number. Another symbol, or both symbols combined, could then be used to examine the top element of the stack without removing it. It would be useful to be able to implement indirection in variable names (this will only operate in an interpreted environment). For example:

```
VAR NAME STRING 100;
    WOW INTEGER;
    BEGIN
    NAME='WOW'
    PRINT @NAME
    END
```

I have assigned the @ symbol for indirection. It is followed by a string variable which contains the actual name of the variable to be used. One could then write lines like: *Print @@@@@@@@@@@@@@@NAME*, which would be guaranteed to irritate everybody.

Stacks are useful in many applications, mainly graphics and languages, but indirected variable names are of more limited use, so I cannot seriously propose them. Of course, they are a type of addressing mode too, as are stacks (on the 68000 at least).

The computer that is going to run our Ideal language will be 16 bit. It will have at least 128K of Ram, and some form of mass storage, so all the ideas I have discussed are quite possible.

The real point of this series is that, despite the great ease with which we have discussed a feasable, useful, powerful language, it will not be adopted. Instead, manufacturers will be sending computers limping on to the market place with Microsoft Basic and Sinclair Basic — even BBC Basic. ■

Jeremy Ruston

Puzzle

Digital letters

Puzzle No 89

Here is an alphamatic number puzzle in which the idea is to substitute digits for the letters in the following multiplication sum:

DAYS × 7 = WEEK

As is usual with problems of this kind, each different letter stands for a different digit, and the same letter always represents the same digit.

How many solutions can you find?

Solution to Puzzle No 84

The program generates the prime numbers from 11 to 99 and can then be modified to determine if larger numbers are prime.

```
10 FOR N = 11 TO 99 STEP 2 20 FOR F = 3 TO
(SQR N) + 1 STEP 2 30 LET X = N/F 40 IF X = INT X
THEN GOTO 70 50 NEXT F 60 PRINT N 70 NEXT N
```

Of the primes between 11 and 99, all those containing either an even digit or a nine can be ruled out. Each of the remaining numbers should be paired, so that the last digit of the first prime matches the first digit of the second. This will result in a list of three digit numbers. Each of these should then be tested by modifying the program to check each number to see if it is prime. Any composites on the list can be crossed off. For example, the first prime, 11, can be paired with 11, 13, or 17 to form 111, 113, and 117. Of these, both 111 and 117 can be eliminated as being non-prime.

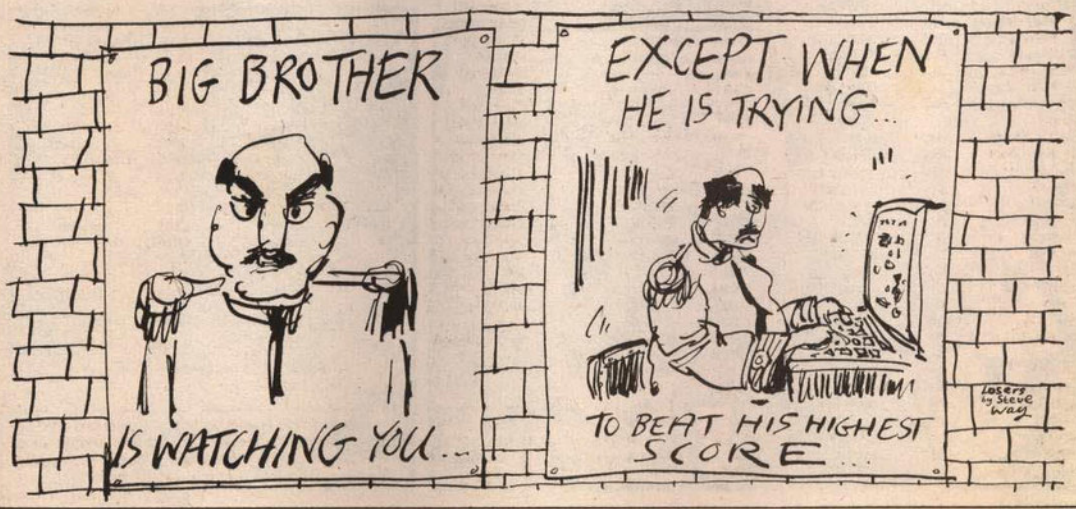
This procedure can be continued with the new list of three-digit numbers by tagging on further two-digit primes. Each of these new four-digit numbers should be tested in the same way. Each time composite numbers can be removed from the list.

The procedure is then continued until all but one number is eliminated.

This final number is the answer: 31373. Every digit, pair of digits, three consecutive digits, and four consecutive digits are prime numbers.

Winner of Puzzle No 84

The winner is: Dave Jones, York Close, Beckton, London, who receives £10.



ADVERTISEMENT

DEAR AUTOMATA, PLEASE RUSH ME THE FOLLOWING SUPERB SOFTWARE: and congratulations on being nominated SOFTWARE HOUSE OF THE YEAR, in the Computer Trade Association Awards.....

"PI EYED" (48K SPECTRUM) The comedy arcade game, just voted "PROGRAM OF THE YEAR" starring The PiMan, with FREE RECORD! £6

"THE PIMAN'S NEW YEAR REVOLUTION" including "PIMAN'S GREATEST HITS" stereo LP cassette, THE PIMAN 1984 CALENDAR BOOK plus THE PIMAN'S OWN BLANK C20 CASSETTE £5

"MY NAME IS UNCLE GROUCHO YOU WIN A FAT CIGAR" (48K SPECTRUM) "Not so much a game, more a way of life. Excellent! (Your Computer) with CONCORD-QE2-HOLLYWOOD PRIZE & FREE SINGLE! £10

"PIMANIA" "The best adventure	48K SPECTRUM	£10
game ever reviewed" (Sinclair	B. B. C. 32K	£10
User) With £6,000 PRIZE and	DRAGON 32	£10
FREE TERRIBLE HIT RECORD !	16K ZX 81	£5

"GO TO JAIL" (48K SPECTRUM) "A triumph of the programmer's art. Full marks. Another superb game from Automata (PCWorld)£6

"YAKZEE" (DRAGON 32 and 48K SPECTRUM) "Bruddy wonderfurr game of ruck and skirr. Pray it! (Confucious) £5

"MORRIS MEETS THE BIKERS" (ANY SPECTRUM) Exciting Arcade challenge, as seen on TV. With outrageous FREE HIT SINGLE! £6

I ENCLOSE THE RIGHT MONEY, OR PLEASE DEBIT MY ACCESS/VISA CARD

CARD NUMBER .....

MY SIGNATURE .....

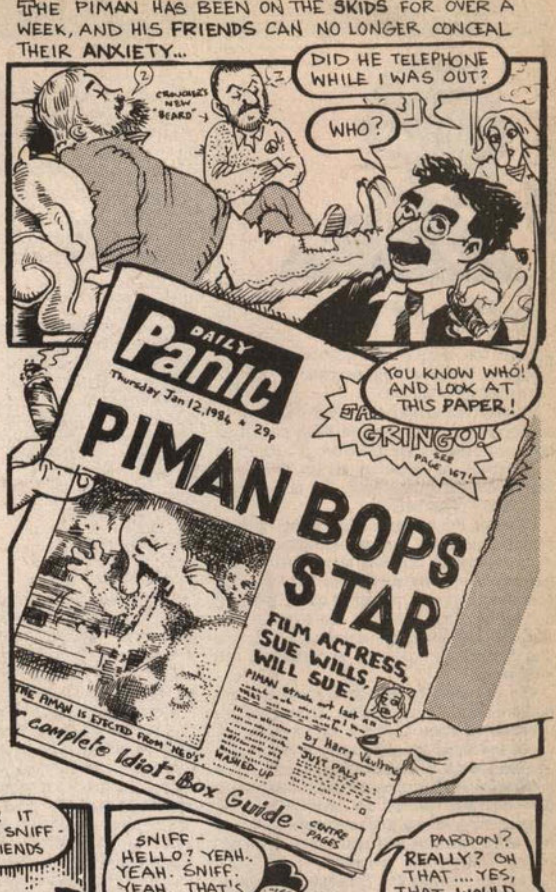
MY NAME .....

MY ADDRESS .....

.....

.....POST CODE .....

NO EXTRAS! ALL OUR PRICES INCLUDE V.A.T. AND DELIVERY. SEND TO :-

AUTOMATA U.K. LTD.
27 HIGHLAND ROAD
PORTSMOUTH, HANTS.
PO4 9DA, ENGLAND

24-hour mail-order service
Telephone (0705) 735242